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# THE IMPACT OF REVENUE DIVERSIFICATION AND ECONOMIC BASE ON REVENUE STABILITY: AN EMPIRICAL ANALYSIS OF COUNTY AND STATE GOVERNMENTS

Wenli Yan

*University of Kentucky*, [wyan3@uky.edu](mailto:wyan3@uky.edu)

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ABSTRACT OF DISSERTATION

Wenli Yan

The Martin School of Public Policy & Administration

University of Kentucky

2008

THE IMPACT OF REVENUE DIVERSIFICATION AND ECONOMIC BASE ON  
REVENUE STABILITY:  
AN EMPIRICAL ANALYSIS OF COUNTY AND STATE GOVERNMENTS

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ABSTRACT OF DISSERTATION

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A dissertation submitted in partial fulfillment of the  
requirements for the degree of Doctor of Philosophy in the  
Martin School of Public Policy & Administration  
at the University of Kentucky

By  
Wenli Yan

Lexington, Kentucky

Director: Dr. Dwight V. Denison, Associate Professor of Public and Nonprofit Finance

Lexington, Kentucky

2008

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## ABSTRACT OF DISSERTATION

### THE IMPACT OF REVENUE DIVERSIFICATION AND ECONOMIC BASE ON REVENUE STABILITY: AN EMPIRICAL ANALYSIS OF COUNTY AND STATE GOVERNMENTS

In recent decades, revenue diversification has become a prevalent practice in state and local government finance. The trend of revenue diversification, according to the portfolio theory, has far-reaching implication for public financial management as it may change revenue stability, which has been an important policy objective for state and local government administrators. This study explores how revenue diversification affects revenue stability from both empirical and theoretical perspectives. Drawing on portfolio theory and regional science literature, this study develops a theoretical framework to explain how the effect of revenue diversification on revenue volatility of sub-national governments varies in terms of its economic base instability. To empirically test the theoretical framework, an econometric model that explores a series of factors that could affect revenue stability is estimated using socioeconomic and fiscal data of 156 Georgia county governments and 47 state governments during the years 1986-2004.

The findings indicate that revenue diversification affects revenue stability conditional on the instability of a jurisdiction's economic base. The county level analysis suggests revenue diversification significantly increases the revenue instability of a county that has a stable economic base and the revenue stabilizing effect of diversification is enhanced as an economic base becomes more unstable. However, the state level analysis shows that revenue diversification significantly reduces revenue volatility for a state that has a stable economic base and the revenue stabilizing effect of diversification decreases when an economic base gets more unstable.

An important policy implication of the dissertation is that the degree of revenue diversification should be gauged by the condition of its corresponding economic base in order to achieve the goal of revenue stability.

KEYWORDS: Revenue diversification, Revenue stability, Economic base instability,  
Portfolio theory, State and local government finance

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Wenli Yan

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6/5/08

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AN EMPIRICAL ANALYSIS OF COUNTY AND STATE GOVERNMENTS

By

Wenli Yan

Dwight V. Denison

---

Director of Dissertation

Eugenia Toma

---

Director of Graduate Studies

6/5/08

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DISSERTATION

Wenli Yan

The Martin School of Public Policy & Administration

University of Kentucky

2008



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Dedicated to my family, for their persistent support and encouragement.

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Looking back, I am fully aware how much I have grown as a researcher and as a person during the past six years. I highly appreciate the instruction and mentoring that I have received and the financial assistance offered by the Martin School. My time in the Martin School is part of my precious memory and will never fade away.

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This research has also been improved based on the feedbacks I have received at professional presentations. These feedbacks have helped to improve the methodological soundness of the analysis and provoked my critical thinking about the implications of my findings.

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## TABLE OF CONTENTS

List of Tables .....	vii
List of Figures .....	viii
List of Files .....	ix
CHAPTER 1: INTRODUCTION	
1.1 Trend of Revenue Diversification in Sub-national Governments.....	1
1.2 Motivation behind Revenue Diversification .....	5
1.3 Research Question .....	6
1.4 Organization of the Study .....	8
CHAPTER 2: LITERATURE REVIEW	
2.1 Revenue Diversification in Corporate and Nonprofit Finance .....	9
2.2 Evolution of Revenue Diversification in State and Local Government Finance...	10
2.3 Implications of Revenue Diversification in Public Finance .....	11
Revenue Growth and Government Expenditure .....	12
Equity and Efficiency .....	14
Other Empirical Evidence Related to Fiscal Performance .....	15
2.4 The Missing Piece of the Tax Structure Puzzle .....	16
CHAPTER 3: THEORETICAL FRAMEWORK	
3.1 Overview of the Theory .....	19
3.2 Revenue Structure and Revenue Stability.....	21
3.3 Revenue Diversification, Economic Base and Stability .....	25
Industrial Diversification and Economic Instability .....	26
Revenue Diversification and Nonsystematic Risk.....	28
Revenue Diversification and Systematic Risk.....	29
Theoretical Framework for the Determination of Revenue Stability .....	31
CHAPTER 4: COUNTY LEVEL EMPIRICAL ANALYSIS	
4.1 Research Hypotheses and Model Specification.....	33
4.2 Data and Research Design .....	34
4.3 The Variables .....	38
Revenue Instability .....	38
Revenue Diversification.....	40
Economic Base Instability .....	42
Other Variables .....	45
4.4 Regression Results .....	47
CHAPTER 5: STATE LEVEL EMPIRICAL ANALYSIS	
5.1 Research Hypotheses and Model Specification.....	56
5.2 Data and Research Design .....	57
5.3 The Variables .....	59

Revenue Instability .....	59
Revenue Diversification.....	61
Instability of Economic Base .....	62
Other Variables .....	64
5.4 Regression Results .....	66
CHAPTER 6: CONTRIBUTION AND POLICY IMPLICATIONS	
6.1 Revenue Diversification in Georgia County Governments .....	76
6.2 Revenue Diversification in State Governments .....	77
6.3 Implications of the Study .....	78
6.4 Limitations and Directions for Future Studies.....	80
References.....	81
Vita.....	85

## LIST OF TABLES

Table 4.1: Variable Information for Revenue Stability Estimation (County Model) .....	47
Table 4.2: Descriptive Statistics of County Model .....	49
Table 4.3: Fixed-effects Estimates for Revenue Instability of Georgia Counties (in Million Squared Dollars) .....	50
Table 4.4: OLS Regression Estimates for Revenue Instability of Georgia Counties (in Million Squared Dollars) .....	51
Table 4.5: Marginal Effect of Revenue Diversification on Revenue Instability of Georgia Counties (in Million Squared Dollars).....	54
Table 5.1: Variable Information for Revenue Stability Estimation (State Model).....	66
Table 5.2: Descriptive Statistics of State Model.....	68
Table 5.3: Fixed-effects Estimates for Revenue Instability of States (in Million Squared Dollars) .....	69
Table 5.4: OLS Regression Estimates for Revenue Instability of States (in Million Squared Dollars) .....	70
Table 5.5: Marginal Effect of Revenue Diversification on Revenue Instability of States (in Million Squared Dollars).....	74

## LIST OF FIGURES

Figure 1.1 .....	2
Figure 1.2 .....	3
Figure 1.3 .....	4
Figure 3.1 .....	20
Figure 3.2 .....	24
Figure 3.3 .....	32
Figure 4.1 .....	36
Figure 4.2 .....	55
Figure 5.1 .....	58
Figure 5.2 .....	74



## LIST OF FILES

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## **CHAPTER 1: INTRODUCTION**

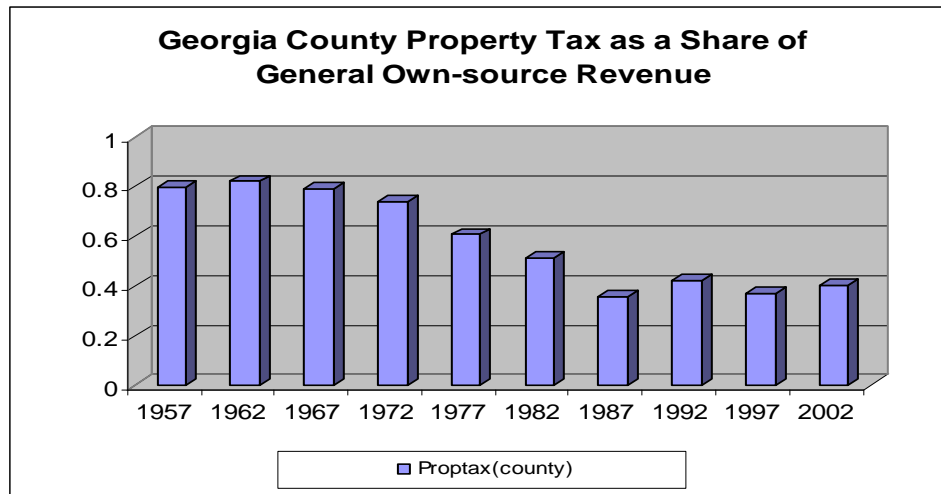
Over the past half century, revenue structure diversification has emerged as an important trend in state and local government finance. The role of the property tax in local government finance has been declining relative to other tax revenues. State and local governments are increasingly relying on multiple sources of revenue. One reason for utilization of multiple tax sources is the benefits of revenue diversification. However, the effects of revenue diversification on revenue stability have been largely unexplored. In particular, an important issue that has not been explored is the interaction between revenue diversification and a jurisdiction's economic base, and how this interaction relates to revenue stability. This dissertation investigates how revenue diversification affects the revenue stability of sub-national governments as it interacts with the corresponding economic base. This research question is examined in two different contexts: first, how revenue diversification affects the revenue stability of Georgia County governments, and second, how revenue diversification affects the revenue stability of U.S. state governments.

To better understand the issue of revenue diversification, the chapter begins with a description of the trend of revenue diversification in sub-national governments. The second section discusses the motivation behind revenue diversification. The third section explores the research question in more detail. The overall organization of the dissertation is introduced in the final section of the chapter.

### **1.1 Trend of Revenue Diversification in Sub-national Governments**

Georgia local governments, like those of other states, have experienced a decline in the property tax as a share of general own source revenue.

Figure 1.1



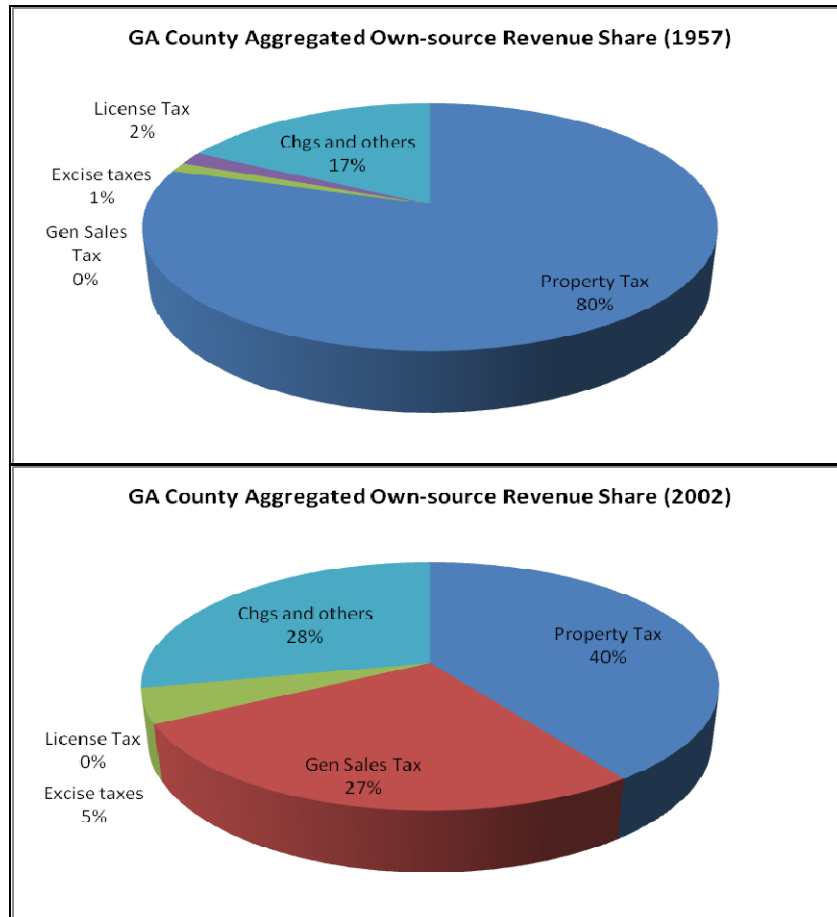
As Figure 1.1 shows, property taxes in Georgia accounted for about 80% of county own source revenue in 1957, while it dropped to 40% in 2002(Census, 1957-2002).

Over the same period of time, local sales and income taxes have turned into an important component of the tax revenues for many local governments across the US, and these two taxes explain much of the reduction of the tax revenue share from property taxes (Sjoquist, 2004). Besides local taxes, local revenues have been augmented through several other sources: 1) intergovernmental transfers (mainly state aid), 2) user charges, and 3) miscellaneous receipts, such as interest earnings (Bartle, Carol, & Dale, 2003).

Intergovernmental funding, especially state aid, has been one of the most important revenue sources for local governments. However, in order to avoid excessive reliance on state money, local governments face the imperatives to raise a significant amount of own source revenue to pay for local activities. As discussed above, local sales and income taxes are two important components that can help to achieve this. User fees have also increased substantially. Other miscellaneous revenues will be small in share, but they are still important in funding local expenditures. These revenue sources are all associated with different drawbacks, so a greater emphasis on developing appropriate revenue portfolios in terms of the desirable goals of taxation, such as stability, adequacy, equity and efficiency, is a positive development that should be continued (Bartle et al., 2003).

Figure 1.2 compares the aggregated own-source revenue structure of Georgia County governments between 1957 and 2002<sup>1</sup>.

Figure 1.2



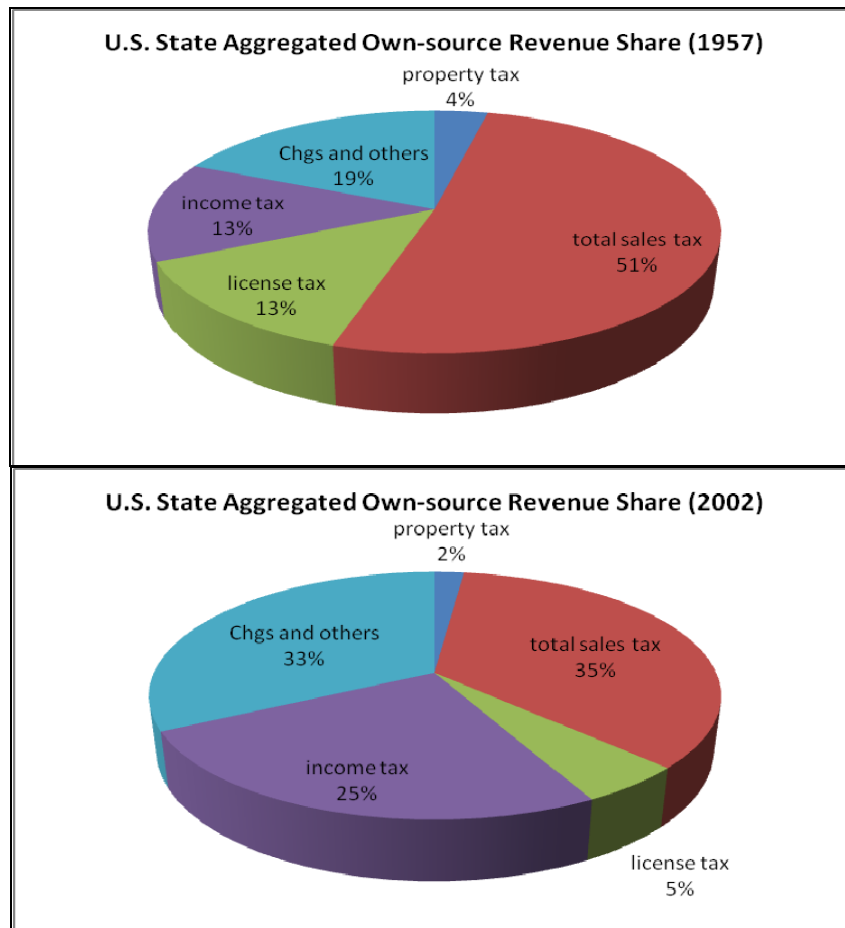
Over these 45 years, shares of other revenue components have significantly increased. For example, general sales taxes increased from zero to 27 %, excise taxes grew from 1.3 % to 4.5 % and user charges rose from 17% to 25%<sup>2</sup>. Given that property tax historically has been the main revenue source for local government, the decline of property tax and increase of other revenue components describe the trend of revenue diversification in U.S. local governments to a large extent.

<sup>1</sup> Source: the Georgia Department of Community Affairs (DCA).

<sup>2</sup> Due to the severe erosion of license tax base in Georgia, license tax share of Georgia counties fell from 1.65 % to 0.01% between 1957 and 2002.

Figure 1.3 compares the aggregated own-source revenue structure of U.S. state governments between 1957 and 2002<sup>3</sup>.

Figure 1.3



Different from local governments, state governments have gradually relegated property tax to local governments since the beginning of the twentieth century (Howe & Reeb, 1997). Therefore, the move toward reliance on multiple revenues in state governments behaved in a different way than it does in the local government. For example, property taxes as a portion of state own-source revenue decreased slightly from about 4% to 2% between 1957 and 2002, total sales taxes decreased from 51% to 35%, license taxes decreased from 13% to 5%, income taxes increased from 13% to 25% and other revenues rose from 19% to 33%. As is shown in Figure 1.2 and Figure 1.3, the

<sup>3</sup> Source: Census of Government.

distribution of different revenue shares for both county and state governments became more even between 1957 and 2002, which provides descriptive evidence of the trend towards revenue diversification in sub-national governments.

## **1.2 Motivation behind Revenue Diversification**

People may wonder what are the underlying forces driving the trend toward revenue diversification. The issue can be understood from two dimensions: a diversified revenue structure can result directly from policy makers' choices to capture the advantages associated with diversification, or it can be a policy reaction to the political and economic constraints of a jurisdiction.

Diversifying revenue sources can be a deliberate or strategic policy action in that it helps to broaden the tax base, provide more stability and flexibility in financial management, and thus achieve better fiscal performance (Bartle et al., 2003). Revenue diversification has been advocated by many governmental organizations like the now defunct Advisory Commission on Intergovernmental Relations (ACIR), the Government Finance Officers Association (GFOA) and the National Advisory Council on State and Local Budgeting Practices (NACSLB) for the reason that a "balanced" revenue structure helps to minimize the loss from any single tax source caused by economic or noneconomic changes, increases the overall revenue stability and reduces the fiscal reliance on higher level governments (Hendrick, 2002). Because of the advantages in reducing revenue instability and the impact of a volatile fiscal environment, revenue diversification has been generally embraced as a desirable practice in state and local government finance.

Sjoquist (2004) argues that political and economic realities could also bring about such changes in revenue structure. 1) Increased expenditure demands are creating pressure for a change in the existing system of revenue. Over the last several decades, federal and state governments have reduced their funding while increasing mandates for local governments. These policy changes, along with an increased demand for public services, have pushed local governments to modify the old revenue structure and develop new, alternative sources of revenue other than the property tax. 2) Local governments face pressures to reduce their reliance on the property tax. Property tax limitations, either

resulting from mandates or from voter resistance, prompt many local governments to search for non-property tax revenues to finance their expenditures (Sjoquist, 2004). For example, local governments in California shifted away from property tax as a result of Proposition 13.

The two dimensions of motivation behind revenue diversification will be elaborated in the second chapter of the dissertation.

### **1.3 Research Question**

As revenue diversification has been a prevailing practice for recent decades, sub-national governments start using multiple revenue sources and decrease the reliance on property taxes either out of strategic consideration or practical constraints. This dissertation from both theoretical and empirical perspective examines the impact of revenue diversification on the revenue stability of local and state governments and whether the impact varies according to the nature of the jurisdiction's economic base. This research question is explored in the context of local and state governments separately.

Revenue volatility has been a major concern for state and local government administrators because stability is necessary for the effective operation of many aspects of a government. Volatile revenue streams can affect the continuity of public service delivery and cause other long run inefficiencies. Stable revenues make it easier for governments to maintain a stable level of public services. Balanced budget requirement and constrained debt capacity make revenue stability an important policy objective for many sub-national governments. Furthermore, most government expenditures that are devoted to personnel or public services are either non-cyclical or pro-cyclical. Increased revenue volatility makes a government more vulnerable to economic downturns and fiscal crises. In addition, the revenue risk transmitted through volatile revenue streams will add to the additional costs of raising capital. One strategy to tackle revenue variability, as recommended by many policy makers, is revenue diversification.

The impacts of revenue diversification have spilled over into different facets of government finance. One direct repercussion is that, the additional sources of revenue through diversification may alter the stability and predictability of revenue streams, and

thus alter the capacity of state and local governments to combat the demands for increased expenditures during economic recessions. Most of the current literature generally agrees upon the positive impact of revenue diversification on revenue stability as it is measured by fiscal performance. However, these studies did not explicitly examine the relationship between revenue diversification and revenue stability, and they fail to take into account the specific characteristics of the economic base from which the revenue is generated. In contrast to the current literature, this paper argues that the effect of revenue diversification on revenue stability varies according to the nature of the jurisdiction's economic base.

Based on portfolio theory from the corporate finance and regional science literature, this study develops a theoretical framework to illustrate the effect of revenue diversification on revenue stability conditional on the nature of its economic base. If a regional economic base is unstable, the volatility of overall revenue will be minimized through tax diversification. However, if a regional economy is relatively stable over time, it may be a sound policy to employ one or two large and stable revenue sources rather than a mix of many unstable small taxes, which increases the instability of the overall revenue. In such cases, a less diversified tax structure is preferred to a diversified one by bringing in stable revenue flows.

From the empirical perspective, since there is significant difference between a local economic base and a state economic base, and a state government normally has higher financial and legislative capacity to control its revenue structure than that of a local government, it is reasonable that the theory may not guide state practices in the same way as it guides a local jurisdiction. Nevertheless, in practice the different realities and political constraints across local jurisdictions result in significant variation in tax structure. Pursuing a theoretically sound tax policy is always an incremental process and oftentimes requires compromise.

This study contributes to the literature on revenue diversification in several ways. First, the previous literature in public finance generally looks at the impact of revenue diversification on fiscal performance. This study directly explores the relationship between revenue diversification and revenue stability, which is a key determinant for fiscal performance. Second, this study not only examines the static effect of revenue



diversification on revenue stability but also the dynamic effect on revenue stability through exploring the interaction between revenue diversification and the varying nature of economic bases. Third, the proposed theory is comprehensively examined in both local and state context.

This study has important policy implications as well. Given that revenue diversification has been strongly advocated as a favorable practice, this piece suggests revenue diversification should be practiced with caution: the degree of diversification in tax structure should be matched with the conditions of the local economy for the purpose of revenue stabilization. The findings from this study also have implications for governments that are seeking revenue growth as a policy objective. In all, knowing the nature of the jurisdiction's economic base, policy makers will be able to adjust the tax structure to achieve the desired policy goals.

#### **1.4 Organization of the Study**

The paper is laid out as follows: the next chapter provides a comprehensive review of the literature on revenue diversification. It includes a summary of the key findings from the relevant literature in corporate, nonprofit and public finance and a discussion about the gap in the current research. The third chapter discusses how revenue diversification, acting with the economic base, influences the revenue volatility. Chapter four empirically examines the theoretical framework developed from the third chapter with relevant data for county governments in the state of Georgia. Chapter five empirically examines a similar theoretical framework with data for forty-seven state governments. The final chapter summarizes the findings and discusses contributions, policy implications, limitations and future research directions.

## **CHAPTER 2: LITERATURE REVIEW**

This chapter begins with a brief review of the literature in corporate and nonprofit finance regarding revenue diversification. The second section introduces the evolution of revenue diversification in state and local government finance. The third section explores the implications of revenue diversification for public finance. The last section discusses the gap in the existing literature that the dissertation will address.

### **2.1 Revenue Diversification in Corporate and Nonprofit Finance**

Revenue diversification is not a new concept in corporate finance research. It contains several dimensions, such as product diversification, geographical diversification and portfolio theory. Revenue diversification in this study draws from the analysis and application of portfolio theory. In terms of portfolio theory, individual securities have greater variability in their returns than the market portfolio which is made up of individual stocks, because diversification can reduce variability (Brealey; & Myers, 1991). By engaging in multiple forms of investment, a firm can reduce its financial risk by lowering the volatility of revenue and profit. Stated another way, financial risk can be reduced by combining a mix of security holdings; doing so hedges against the loss of any single holding while enabling the growth of the portfolio over time (Frumkin, 2002). A similar rationale can be applied to the revenue structure of government and nonprofit organizations. A mix or balance of different revenue sources can be an effective strategy to increase revenue stability and reduce the financial risk of an entity. Such stability is realized by developing multiple revenue sources that are imperfectly correlated (Chang, 1994). One thing to bear in mind is that the risk, which can be eliminated by diversification, is called unique risk or unsystematic risk; however, a well-diversified portfolio is still subject to market risk, such as the performance of the overall economy (Brealey; & Myers, 1991). A detailed discussion on portfolio theory will be provided in the theory chapter.

The corporate finance literature suggests that achieving greater debt capacity is one of the potential benefits of diversifying businesses within a firm. This benefit arises from combining businesses with earnings streams that are not perfectly correlated and

hence reducing the volatility of revenue and profit. This coinsurance effect provides diversified firms with greater debt capacity than that of single-segment firms (Berger & Ofek, 1995). In nonprofit sectors, revenue diversification as a financial strategy has been broadly accepted and there is evidence that a diversified revenue structure may increase the financial health and sustainability of an organization (Chang, 1994; Frumkin, 2002).

## **2.2 Evolution of Revenue Diversification in State and Local Government Finance**

The initial wave of diversifying revenue sources can be traced back to the Great Depression period when property values and property tax revenues experienced significant decline (Ulbrich, 1991). As a result, state governments desperately sought new revenue sources, such as sales and income taxes, to reduced or replace their reliance on property tax revenues and finance public expenditures (Fisher, 1997; Howe & Reeb, 1997). However, the property tax remained the most important tax source for local governments and was mainly used to pay for education and municipal services (Fisher, 1997).

The subsequent move towards revenue diversification took place in the 1960s and 1970s as a response to the fiscal crises of sub-national governments and the tax revolts. The demographic changes caused by the “baby boom” in the 1950s and 1960s plus the “stagflation” in the late 1960s and 1970s drastically boosted government expenditures and revenues (Bartle et al., 2003; Steurele, 1992). The significant inflation drove up property values and led to greater property tax burden relative to personal income, which fueled the anti-tax sentiment of the public and ignited the movement that limits the size and growth of government spending (Bartle et al., 2003; Rabushka & Ryan, 1982). The most noticeable example is the passage of California’s Proposition 13, which greatly reduced property tax revenue of California mainly by rolling back property values, capping property tax rates and capping annual tax increases (CBP, 1997; Zhao, 2005). Another similar case is Proposition 2-1/2 in Massachusetts.

In addition to the consequences brought by the demographic and economic changes (e.g. tax revolt), federal policy toward states and localities has contributed to the shift away from the property tax as well. Since the Nixon Administration, the federal government has been devolving policy responsibilities to the states, and thus reduced

federal aid to state and local governments. Meanwhile, state aid to local governments did not increase in proportion to the obligations that state governments had relegated to local governments. “This state aid shortfall coming on the heels of the decline in federal aid prompted local governments to seek new authority to obtain revenues by means other than the property tax.” (Bartle et al., 2003)

Facing the double pressure of ever-growing demand for public services and the opposition to property tax increases, a reasonable reaction for local governments is to look for alternative revenue sources, such as local sales tax, income taxes and user charges. Although the primary target of the taxpayer opposition was the local property tax, the impact has also been extended to state governments through the form of limitations on revenue and expenditure or the size of their growth (Joyce & Mullins, 1991). The tax revolt and the resulting limitations on revenue and expenditure largely changed the fiscal environment of local and state governments. Thus, revenue diversification is perceived as an important way for local and state governments to cope with the fiscal stress and maintain their operations (Carroll, 2005).

The increasing unpopularity of the property tax provides one dimension of the motivation that furthers the pace of revenue diversification. However, a more balanced revenue structure by using multiple revenue sources is also gaining attention because of its effects on other aspects of fiscal management and performance, including government spending, efficiency and equity as is discussed in the next section, which is related to the other dimension of the motivation behind revenue diversification.

### **2.3 Implications of Revenue Diversification in Public Finance**

As a concept, diversification refers to the process of changing the level of revenue diversity and selecting assets to minimize risk (P. B. Siegel & Johnson, 1995), so a jurisdiction with a diversified revenue structure can be described as relying on a variety of revenue sources. This diversified revenue structure will avoid the imbalanced use of a given revenue source at the cost of other revenue sources (Suyderhoud, 1994).

The greatest advantage of revenue diversification as it is practiced in public finance is the perceived stability and predictability of revenue flow brought by the various revenue sources. The theoretical and empirical verification of the relationship

between revenue diversification and revenue stability will be further discussed in the theory and empirical chapters. Since the uncertainty of revenue sources or fluctuations in revenue streams can cause disruption in service delivery and other long-term inefficiencies (Hendrick, 2002), revenue diversification comes into play as a remedy. Furthermore, the balanced budget rule and limited debt capacity make the issues of revenue growth and variability a concern for state and local governments (B. M. Braun, Johnson, & Ley, 1993). With the additional funding sources, local governments have greater capacity to accommodate the increased demands of spending as a result of economic cycles, natural disasters, judicial mandates or political actions (Suyderhoud, 1994; White, 1983). Expanding the repertoire of revenues may also help to achieve greater stability in cash management and more flexibility in budgetary planning.

Some scholars are skeptical about the effects of revenue diversification for “there is little direct evidence of whether revenue diversity, balance or stability actually decrease the costs of administration and decision-making, increase the efficiency of government operations, or improve financial management” (Hendrick, 2002). A similar view is shared by Ladd and Weist (1987), who argued that a diversified revenue structure does not necessarily help to achieve tax policy goals like efficiency, equity and adequacy. The best tax structure, according to their view, should be the one reflecting the emphasis on the different policy objectives of a government and it may not be the most diversified. However, a majority of the existing literature lends support for the positive impact of revenue diversification on the fiscal performance of government. In the public finance literature, fiscal performance has been measured in terms of adequacy in generating sufficient revenue to pay for government costs and public services (Hendrick, 2002; Suyderhoud, 1994), equity among different taxpayers and efficiency in promoting minimum taxation. The relationship between revenue diversification and fiscal performance in terms of the three aspects (adequacy, equity and efficiency) and other empirical evidence is discussed in the rest of the section.

### ***Revenue Growth and Government Expenditure***

In government finance, revenue and expenditures are closely related. Revenue receipts determine the amount of resources available, while changes in the level of

revenue also simultaneously reflect changes in demand for expenditures. The following discussion focuses on the current research on the relationship between revenue diversification and government spending.

It is a common perception that there is a direct relationship between tax diversification and government revenue or expenditures (Misiolek & Harold, 1988). However, the literature as to the impact of tax diversification on government expenditures is hardly conclusive. Some proponents of tax diversification argue that, given a diversified tax structure, non-property taxes simply serve as substitutes for property tax receipts and hence they will not affect expenditures (Sjoquist, 2004). However, there is an argument that tax diversification brings about increased public awareness of government costs and thus it constrains government expenditures (Downs, 1960; Sjoquist, 2004). On the other hand, Buchanan (1967) argues that a diversified revenue structure tends to generate fiscal illusion and increase government expenditures; the details of this argument will be discussed in the next part of this section. Alternatively, Sjoquist (2004) argues that the level of government expenditures is affected by the tax structure from the perspective of the median voter.

In the public finance and public choice literature, there are two distinct views with respect to the effect of revenue diversification on the size of government: fiscal illusion and fiscal stress. The fiscal illusion hypothesis mainly argues that citizens' perception of government expenditures can be obscured by the way in which taxes or other revenues are collected. This argument is consistent with the Leviathan view of government (James M Buchanan, 1967; James M. Buchanan & Wagner, 1977; Sjoquist, 2004). To be more specific, a complicated tax structure designed by government decision makers may disguise the real tax burdens and lead to a false perception of the cost of government by creating an illusory effect, so that voters underestimate the tax price and expenditures will go beyond the levels desired by voters. Given the existence of fiscal illusion, voters feel less repellent to a given tax levy if the tax is collected through a larger number of individual tax bases, so a diversified revenue structure can increase total tax revenue (Conybeare, 1982; Sjoquist, 2004) and lead to an inefficiently large government (Misiolek & Harold, 1988). This view is supported by a group of scholars, such as Buchanan and Wagner (Sjoquist, 2004), who argue that revenue diversification may

generate fiscal illusion and in turn boost government expenditures. If this argument is correct, it implies that policy makers should be able to enlarge the government budget through adjusting the tax structure.

On the other hand, the fiscal stress argument works under the assumption of a well-informed general public and states that revenue diversification can better ensure the continuity of public service and lower other costs caused by revenue variability (Misiolek & Harold, 1988). Theoretically, the instability of revenue streams should negatively affect the size of the government, but the effect of a diversified tax structure on government expenditures may reflect the benefits of smoothing the revenue streams instead of a misperception of the tax burden (Misiolek & Harold, 1988).

The empirical findings regarding the impact of tax diversification on government expenditures are also not consistent. Wagner (1976) found that diversified revenue structures have helped city governments collect more revenue. Breeden and Hunter (1985) looked at 37 cities and found results consistent with Wagner's but Ladd and Weist (1987) did not. Even within the competing view of fiscal illusion vs. fiscal stress, no agreement can be reached. Misiolek and Harold (1988) have found empirical support for the fiscal stress but not fiscal illusion argument. Other research shows that fiscal illusion causes local government overspending (Carroll, 2007; Turnbull, 1998) but its impact on government spending varies across sectors (Carroll, 2007; Turnbull, 1993).

### ***Equity and Efficiency***

The idea of revenue diversification can also be justified from "supply-side" economics. The Laffer curve predicts that tax revenue will reach its maximum at some tax rate that is larger than 0 but not yet 100 percent. A tax-maximizing state will have a strong incentive to diversify its tax revenue to avoid going beyond the revenue-maximizing rate and depleting any given tax base (Conybeare, 1982). By doing this, equity can be promoted by taking taxes from entities that can avoid some taxes but have to pay elsewhere (Carroll, 2005; Ulbrich, 1991). Also, a diversified tax structure could reduce the marginal tax burden and increase economic efficiency by broadening the tax base for a given level of revenue (Carroll, 2005; Sjoquist, 2004; Ulbrich, 1991).

On the other hand, the view of fiscal illusion provides a counterargument to efficiency because revenue diversification, according to this view, tends to complicate the existing tax structures and can lead to a bigger government by increasing tax burdens or expenditures. Therefore, some scholars argue that revenue diversification is more inefficient as a result of fiscal illusion (Hendrick, 2002; R. E. Wagner, 1976). However, Misiolek and Harold (1988) found little empirical evidence to support the fiscal illusion argument.

### ***Other Empirical Evidence Related to Fiscal Performance***

The positive effect of revenue diversification on fiscal performance has been empirically examined and agreed on by much of the recent literature. For example, Suyderhoud (1994) examines how revenue diversification affects fiscal performance. With a robust quantitative measure of diversification, he shows that revenue diversification and a balanced use of revenue sources as a policy goal has a positive impact on fiscal performance, measured by the level of spending, revenue adequacy, equity and efficiency (Suyderhoud, 1994). In another study investigating whether state and local fiscal structure plays a role in determining fiscal stress, local revenue diversification is found to lower fiscal stress (Shamsub & Akoto, 2004). Since a tax effort index is often perceived as a good indicator of fiscal stress, similar findings are found in Hendrick (2002). Her study models the impacts of revenue diversification on tax effort using data from the Chicago metropolitan region, and the findings suggest that revenue diversification is associated with lower tax effort (Hendrick, 2002).

In summary, the existing research related to revenue diversification in public finance has more or less accepted the view that revenue diversification should be an important policy goal for state and local government finance inasmuch as it helps to achieve the goal of equity and efficiency, plus it improves fiscal performance (Carroll, 2005; Shannon, 1987; Suyderhoud, 1994; Ulbrich, 1991). Many governmental organizations like ACIR, GFOA and NACSLB advocate the practice of revenue diversification for similar reasons. Comparing the current trend in revenue diversification to the historic reliance on property taxes for the majority of U.S. local governments, it is



not hard to conclude that revenue diversification could enable the local governments to have a stronger financial stand and thus better fiscal performance (Bartle et al., 2003).

The evolution of tax structure and the advantages associated with revenue diversification coincide with the two dimensions of motivation behind revenue diversification. Revenue mix is an empirical observation. It is an interesting question as to whether revenue diversification is a result of policy decisions, or a reaction to socio-economic and political factors, or both, but it is beyond the scope of the dissertation. The primary goal of the study as discussed next is to investigate the effect of revenue diversification on the revenue stability of local and state governments.

## **2.4 The Missing Piece of the Tax Structure Puzzle**

Although the advantages of revenue diversification have been widely discussed in a variety of literature, the traditional debt management research and practice have a special emphasis on a closely related but different concept: economic base diversity. Under the shadow of economic base diversification, the theoretical and empirical verification with respect to the effects of revenue diversification on revenue stability is still a key missing piece to the tax structure puzzle.

An economic base refers to the composition of the economic structure of an area, namely, the variety of businesses and employers found in an area and their relative proportions. Clearly, each region has its own mix of industries which serves as economic drivers of the regional economy and the unique composition of industries could be partially attributed to the region's comparative advantages, such as natural resources and geographical advantages (Froeschle, 2005). The primary reason why economic base diversity has gained special attention is that government revenues rely on income, which is generated from a wide range of economic activities or an economic base. Large and random swings in economic activities can jeopardize a stable inflow of tax money (Loviscek & Crowley, 1990). Past research holds the view that "revenue variables are less important in bond ratings than the base from which the revenues are taken" (Hildreth & Miller, 2002). A similar view is also held by rating agencies. Standard & Poor's rating criteria (2005) perceives the strength of the local economy is a determining factor of

revenue volatility and financial growth prospects, so economic base is a critical consideration in credit rating assessment.

High income level and a diverse economic base will better protect a region against economic changes and external shocks, and provide that region with superior debt-repayment capacity (Standard&Poor's, 2005). However, this paper suggests that a diverse economic base by itself does not ensure a government entity the strong ability or flexibility in managing all of its financial obligations. To be more specific, a diverse economic base helps to generate stable tax revenues only when acting with its compatible tax structure. The role of revenue structure, particularly its degree of diversification, which plays in determining revenue stability, has been largely understated in the existing literature.

To explain this, we first need to understand how a government uses the economic outputs to pay for public services. As we know, an economic base is the foundation for all sorts of revenues for a government. When policy-makers define the range of economic activities or tax base from which the government revenues<sup>4</sup> are taken, they also assign the appropriate tax rate for each category of taxes. The tax revenues of a government are determined by the tax rate and the range of the tax base. In other words, the categories of taxes (tax base) and its relative proportion (tax rate) compose the tax or revenue structure of a government. With the influx of revenue, a government provides a wide range of public services. As such, a sound revenue structure is very important in that it helps to generate sustainable and adequate resources available to redistribute to the public by delivering a wide range of public services.

From the discussion thus far, we can see that, besides a strong economic base, the basic structure of a tax system also plays an important role in determining the stability and growth of government revenues. The analysis from Braun and Otsuka (1998) further confirms this view by showing that both tax structure and economic conditions have significant effects on the stability and growth of tax revenue flow. However, their study simply assumes that economic conditions affect revenue flow directly or indirectly through tax structure and it breaks down the tax structure by components. There are two

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<sup>4</sup> In this study, government revenues refer to the own-source revenue, which includes revenue from taxes, fees, and other miscellaneous own-sources. Also, revenue (structure) and tax (structure) are used interchangeably, because a fee can be perceived as a user or service tax.

main drawbacks associated with the analysis: first, it does not consider the tax portfolio as a whole, which may bias the study by failing to account for the correlation between different taxes, and second, it fails to recognize the important interaction between economic base and tax structure in determining the revenue inflow. Put in other words, matching a given economy with a different tax structure can bring about significant changes in the levels of revenue growth and stability. Alternatively, applying similar tax structures to all regions with different economic conditions is also not a desirable strategy for governments with an objective of revenue stabilization. My study aims to fill the gap in the current literature by showing that both tax structure and economic conditions affect revenue stability, and revenue stability can be improved through an appropriately selected tax structure.

Although both stability and growth are important for government finance, this study only focuses on the side of stability considering its special role in budget planning. Government budgets are usually made before the actual revenues are realized and legislators make expenditure decisions “based on the assumption of predictable and steady growth over time”(White, 1983). In addition, state and local governments are expected to maintain a balanced budget and many of them are facing constraints in borrowing power. As such, stability plays a critical role in fulfilling both the long term and short term commitments of a government entity.

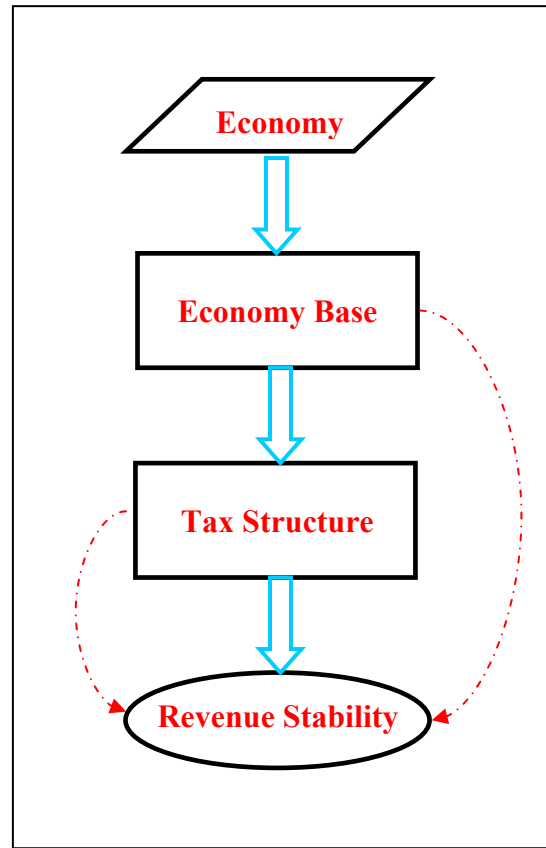
## **CHAPTER 3: THEORETICAL FRAMEWORK**

Building on the portfolio theory in the corporate finance and regional science literature, this chapter aims to develop a theoretical framework that describes how revenue structure and economic conditions, indicated by the varying nature of economic bases, act together to affect the revenue stability of a region. The first section gives the overview of the theory that explains the relationship among economic base, revenue diversification and revenue stability. An important issue in understanding the effects of revenue diversification is to separate its influence on revenue stability from that of the economic base. To accomplish this, the second section of this chapter examines the direct relationship between revenue structure and revenue stability by isolating the effects from economic bases. The third section explores the relationship between revenue diversification and stability while taking into account the intermediate influence of economic base.

### **3.1 Overview of the Theory**

The principal theory of the study reveals the relationship among economic base, revenue diversification and revenue stability: revenue diversification affects revenue stability through its interaction with the economic base.

Figure 3.1



As Figure 3.1 illustrates, a regional economic base which is composed of a variety of industries and sectors, provides the groundwork for a well-defined government tax structure. When this tax structure interacts with the regional economy which is reflected by the level of outputs from the economy base, it will generate the revenues that maintain the daily functions of a government. Whether the revenue flow is stable has great implications for the financial position of that particular government. To be specific, increased revenue instability affects the continuity of governmental service delivery and makes a government more vulnerable to changes in economic and fiscal conditions. Further more, volatile revenue streams also constrain a government's debt capacity. The previous research either focuses on the relationship between economic base and revenue stability as measured by credit ratings or emphasizes the positive effect of a diversified tax structure on revenue stability, measured by fiscal performance without explicitly examining the relationship between revenue diversification and revenue stability. It is important to connect these two pieces together by showing how tax structure, acting with

the economic base, affects the revenue stability. Furthermore, the economic base varies region by region: some may be more stable than others. For example, a college town that mainly relies on income from a university presumably has a different economic base than that of a jurisdiction which largely depends upon income from tourism. Therefore, it is important to break down the economic bases into different types and identify the compatible tax structures. This paper posits that given the varying nature of economic bases, a sub-national government should match its base with the appropriate tax structure with different degrees of diversification. As a result, the revenue stability can be improved through a well-matched tax structure.

### **3.2 Revenue Structure and Revenue Stability**

In corporate finance, risk means the market return is hard to predict or volatile over time. According to portfolio theory, diversification helps to reduce risk or variability, provided that different stocks in an investment portfolio do not move in exactly the same direction or the price changes of different stocks are less than perfectly correlated (Brealey; & Myers, 1991). There are two types of risks we need to distinguish: unique (unsystematic risk) and market risk (systematic risk). The unique risk stems from the adverse conditions that surround a particular company or industry. This risk can be eliminated by diversification. However, the market risk cannot be eliminated through diversification and it comes from the economy-wide perils which affect all businesses. For a well-diversified portfolio, the only thing that matters is the risk that investors cannot get rid of – the nondiversifiable ones. Since a single security's contribution to the (market) risk of the whole portfolio depends on how sensitive the security is to the market movements (measured by beta), the risk of a well-diversified portfolio “equals the average beta of the securities included in the portfolio” (Brealey; & Myers, 1991). If the portfolio risk is driven by the betas of each different security, it implies that diversification cannot only eliminate the stand-alone risk, but also adjust the market risk of the portfolio by changing the combination of different securities.

In the context of government finance, the idea of revenue diversification is similar to investment diversification. We may consider the various revenue sources or tax bases as a government's investment portfolio and each tax as one of the securities in the

portfolio. The variability of tax revenue is analogous to the concept of volatility in market returns in corporate finance. According to White (1983), revenue diversification in government finance relates to the correlation between two or more taxes. In order to reduce revenue fluctuation, a desirable tax structure should include taxes that are not perfectly correlated. In other words, the different tax revenues will not move in exactly the same direction and magnitude at the same time. In this way, when one tax shrinks for some reasons such as an economic downturn, the total loss of government revenue is minimized because other revenue sources have not experienced the same changes (White, 1983).

White's research clearly defines the unsystematic risk related to any single tax revenue and describes how diversification helps to minimize this stand-alone risk in public finance. As we know from portfolio theory, the stand-alone risk is less of a concern for a well-diversified portfolio. Investors tend to focus more on the market risk coming from the general economy, because different investment portfolios may vary in the market risk (beta) in terms of the market sensitivity or market risk of each asset included in the portfolio. As a result, investors can alter the risk of a portfolio by reshuffling the combination of assets. However, similar to White's study, the previous literature has uniformly assumed the instability is caused by random fluctuations without considering the fact that economic conditions can also cause changes to the tax base and thus the expected value of tax revenues (Bradley M. Braun & Otsuka, 1998; H. M. Groves & C. H. Kahn, 1952). As a policy maker, one may need to go beyond the diversifiable risk and consider how to use different combinations of taxes to change the systematic risk, which is subject to the general economic condition.

In government finance, the degree of revenue variability is greatly determined by the income elasticity of tax revenues. The elasticity of each tax indicates that individual tax revenues have different degrees of sensitivity to the general economic condition by nature. In this sense, the income elasticity of a single tax's revenue is analogous to the concept of market risk or beta of each individual security in an investment portfolio.

According to previous research, corporate and individual income taxes have been generally classified as having high income elasticity, general sales taxes<sup>5</sup> as medium and property and excise taxes as having low income elasticity. A larger share of total revenue from elastic taxes results in the total revenue being more susceptible to the short-run business cycle, which causes fluctuations in revenue streams (White, 1983). On the other hand, it is an often unstated assumption that an inelastic revenue system typically leads to a cyclically stable revenue system (Dye & Merriman, 2004). Therefore, by changing the tax structure to include taxes with low elasticity, the revenue risk subject to economic cycles can be reduced. The trade-off is that returns or revenue growth will not increase as much during periods of economic growth as it would for a tax structure with more elastic taxes.

To realize the goal of revenue stabilization, as one may argue, an alternative approach is using some forms of financial reserves, such as budget stabilization funds (rainy day funds). With rainy day funds, a government can still choose a revenue portfolio with high elasticity in that when the economy is experiencing high growth, the higher surplus of revenue brought by the elastic tax structure can be set aside as financial reserves and used in lean years. Theoretically, revenue instability from economic fluctuations can be minimized through the stabilization function of slack resources. However, only the rainy day funds with explicit rules and procedures of deposits and withdrawals could effectively help to increase savings and protect a state from the negative impacts of recessions (Hou, 2002; G. A. Wagner, 1999). In practice, the funding mechanism of rainy day funds are largely subject to political involvement, and elected officials tend to prefer current spending to savings (Hou, 2002). Furthermore, states show great variation in terms of the procedures for disbursement (Joyce, 2001). The political and practical constraints of rainy day funds or other slack resources make it hard to be used as an independent fiscal device to achieve the goal of stabilization. Therefore, financial reserves could at most serve as a complement to revenue diversification to shield a government from revenue shocks during downswings.

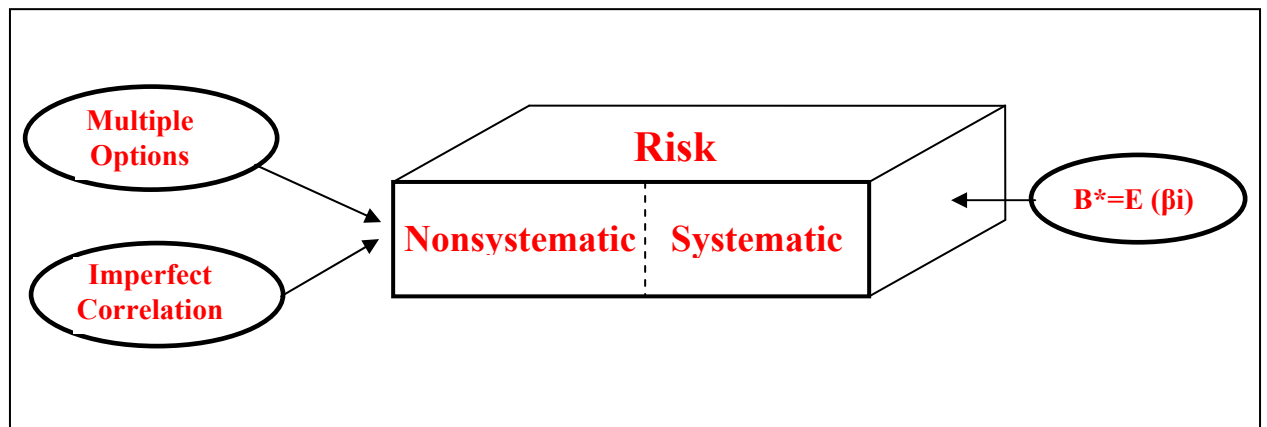
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<sup>5</sup> The elasticity of general sales tax also depends on whether the tax base is broad or narrow. For example, if daily consumption goods, such as food, are exempted from tax, the sales tax can be fairly elastic.



In summary of the above discussion, different strategies should be employed to reduce the unsystematic and systematic risk associated with revenue volatility. The general ideas are illustrated in Figure 3.2. 1) Diversification helps to eliminate the nonsystematic risk subject to two conditions: a large number of revenue options exist, and there is imperfect correlation between revenue sources. Also, 2) to reduce systematic risk, the elasticity ( $\beta^*$ ) of the revenue portfolio, which is the weighted average of the elasticity of each tax, can be adjusted by selecting a mix of taxes with low elasticity ( $\beta_i$ ). The idea of correcting the systematic risk adds to White's work by allowing the inelastic tax combination to lower the market risk (beta) of the entire government tax portfolio.

Figure 3.2



In the practice of government finance, the actual effect of revenue diversification should be investigated separately in terms of nonsystematic and systematic risk. Given limited revenue choices, the nonsystematic risk can be lowered to some extent but can hardly be removed as it is in the investment portfolio. Also, the correlation between these revenue sources should be examined. For systematic risk, the key is how revenue diversification changes the elasticity or beta of the entire government revenue portfolio. Revenue diversification can increase the overall elasticity or beta and reduce the revenue stability by having a combination of elastic taxes, though it may lead to revenue growth. Similarly, revenue diversification can also help to create a revenue portfolio with low elasticity with the appropriate tax selection. Therefore, the overall effect of revenue

diversification is unclear without specific analysis on the nature and composition of the tax portfolio.

### **3.3 Revenue Diversification, Economic Base and Stability**

The unique mix of economic sectors in an area drives the regional economy and provides the government with possible tax revenue sources. Clearly, the fluctuations in a regional economy can influence the tax revenue streams. However, the perceived dominant influence of the economic base on revenue stability is a naive or oversimplified understanding of the way that revenue stability is determined in that it ignores the interaction between the economic base and the tax structure; it is this interaction that alters the revenue streams.

An economic base refers to the unique economic structure of a region, which can vary greatly in terms of its nature and composition. The industry composition determines the sources of economic outputs and hence the range of revenue options. More importantly, the composition of an economic base, e.g. the types of sectors and their relative shares, determines the nature of the economic base, which can be described by the economic instability of the region<sup>6</sup>. When a regional economy experiences business cycles or random shocks, output and employment fluctuates around the trend as market demand for a regional product or service varies (Froeschle, 2005). This in turn affects government tax revenues. However, the varying nature of economic bases makes the economic activities in a region more or less subject to business cycles or other external fluctuations.

In the following text, the instability of an economic base is used to capture the economic impact of the external risk, which mainly includes nonsystematic risk caused by random shocks and systematic risk from business cycle to the economic base or tax bases<sup>7</sup>. By reflecting the extent to which economic bases are affected by external risk, economic instability helps to classify different types of economic bases. Each economic

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<sup>6</sup> In this study, economic instability of a region and instability of an economic base are used interchangeably. Both of them refer to the regional income and employment fluctuations caused by external risk.

<sup>7</sup> External risk sometimes also includes seasonal fluctuations. To simplify the theoretical framework, the discussion here focuses on two types of risk: nonsystematic and systematic risk.

sector or industry<sup>8</sup> has different instability. The overall instability of an economic base is determined similarly to that of an investment portfolio by considering the instability of individual economic sectors. Therefore, the overall instability of an economic base differs in terms of the industry composition and the instability of individual sectors.

Revenue structure has an active influence on revenue volatility as well. Theoretically, to minimize revenue volatility, a government could purposefully define a set of economic activities as tax base and create a tax portfolio with multiple revenue sources and low elasticity. Since the nature of economic bases is different across jurisdictions, a tax portfolio that serves the goal of stability should be specifically tailored to the characteristics of each economic base and should vary across jurisdictions. Put another way, if we designate an equally well-diversified tax portfolio to a region ignoring the nature of its economic base, the effect of revenue diversification on revenue volatility can vary. Since the changes in economic bases are realized through a gradual process with uncertainty, from a short-run perspective it is meaningful to take the nature of an economic base as given and examine how the effects of revenue diversification on revenue stability change according to the unique nature of an economic base, particularly its instability.

Given that the composition of an economic base and its nature are closely tied, the first part of the following discussion focuses on the causal relationship between industrial diversification and the economic instability of a region. To find out the specific effects of revenue diversification on revenue stability<sup>9</sup>, the second part of the discussion is provided in terms of the types of revenue risks. The final part of the discussion depicts the overall theoretical framework of the study.

### ***Industrial Diversification and Economic Instability***

The causal relationship between local industrial diversification and economic instability has been through considerable debate for nearly 60 years. The related regional science literature has generally accepted the view that 1) economic diversity has a positive impact on economic stability, 2) greater specialization increases cyclical

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<sup>8</sup> Although some research considers individual industries as building blocks for sectors, they are interchangeable in this study.

<sup>9</sup>For the purpose of theory development, here I assume that there is no tax exportation.

instability, and 3) a larger regional economy tends to increase diversity and be more stable (Conroy, 1972; Dissart, 2003; Jackson, 1984; Thompson, 1965).

The positive relationship between economic diversity and stability is intuitive: a heavy reliance on a single or few industries for the totality of regional income is risky. The regional economy becomes extremely sensitive to fluctuations in the key industry or industries. These fluctuations could be caused by changes in productivity or sharp swings in prices or income. A region will suffer more if a majority of the regional employment is engaged in those industries because the regional economy is not diversified enough to absorb the recessionary effects caused by the employment and income losses. On the opposite side, the greater diversification of industry helps the regional economy to be less likely affected by general declines (Froeschle, 2005; Kort, 1981).

Another noteworthy point here is the relationship among size of a jurisdiction, industrial diversification and economic stability. Many studies have found that there exists a significant and positive relationship between economic diversity and jurisdiction size (Clemente & Sturgis., 1971; Kort, 1981; Marshall, 1975; Thompson, 1965). Thompson argued that large urban economies are relatively diversified and stable, while the smaller urban economies have a wider range of cyclical instability, “as some tend to specialize in the more unstable and some in the more stable industries” (Thompson, 1965). Furthermore, even if we take the degree of industrial diversification as given, increased economic stability is associated with larger local economies (Brewer & Moomaw, 1985). In this sense, jurisdiction size affects economic stability both directly and indirectly through adding to the diversity of the economic base.

Although the positive causal relationship between industrial diversification and stability of the regional economic base has been more or less agreed upon, the definition and measurement of industrial diversification suffer from a lack of theoretical and statistical consistency (Jackson, 1984). Furthermore, the positive relationship between industrial diversification and stability of a regional economy has been challenged both from theoretical and empirical perspectives in that there are a few regional economies that have high levels of specialization, but they have historically experienced little fluctuation relative to the national economy. Two classic examples are small college towns and state capitals. These local economies are highly specialized but stable over

time (Kort, 1981). The basic reasons for the existence of the anomalies is that economic diversification measures the soundness of the economic base, but it fails to consider the fact that industries have varying stabilizing effects and some industries have much stronger stabilizing effects than others (Hastie, 1972).

From the above discussion, we may conclude that the positive relationship between industrial diversification and stability of the regional economic base has strong conceptual appeal to many policy makers and researchers. However, the theoretical and empirical limitations of industrial diversification make it hard to fully account for the stability of a regional economy. In addition, it is important to take into account the influence of jurisdiction size given that past literature suggests the stability of a regional economic base is also affected by its size.

### ***Revenue Diversification and Nonsystematic Risk***

Revenue diversification affects the nonsystematic risk of each tax portfolio in a similar way regardless the natures of economic bases. With a given economic base, a well-diversified tax structure can minimize the unsystematic or stand-alone financial risk and increase the stability of revenues. The unsystematic risks to tax receipts can be described as a catastrophic loss from any single tax revenue resulting from economic swings, legal or political actions (Suyderhoud, 1994) and other random events. Diversification cannot, however, eliminate the market risk or systematic risk caused by business cycles. To be more specific, when economic declines happen, some negative impacts will converge upon the whole economy and will be unavoidable, while some revenue risk can be diversified away through the interaction of an economic base and its well-diversified tax structure. The key point here is that a vital economic base and a well-diversified revenue structure, including tax base and tax rate, must act together to lower the financial risk presented by tax revenue instability. Without an economic base with a variety of industries or sectors, it is meaningless to talk about diversifying revenues. On the other hand, even if a region has a mix of industries, the risk from a dramatic loss of individual revenue sources cannot be alleviated without diversification and balance in revenues. Therefore, both economic conditions and tax structure diversification are important in stabilizing tax inflows.

However, as discussed earlier, changing the structure of an economic base (e.g. degree of diversification) and further its nature (e.g. instability) is a long-term process and this study takes the nature of the economic base as given from a short-run perspective. In addition, sub-national governments are oftentimes constrained by limited revenue options, implying that stand-alone risks are hard to eliminate. Furthermore, there is no significant difference in revenue variety for each level of sub-national governments, which means most of these governments are subject to similar degrees of non-systematic risks. To better approach the problem of revenue volatility, attention should be focused on reducing the systematic risk by adjusting the relative shares of each revenue component.

### ***Revenue Diversification and Systematic Risk***

The distinguishable effects of revenue diversification on revenue stability lie in the way it works on systematic risk, which surrounds all businesses or sectors in a region or even the entire country. Generally speaking, there are a variety of economic sectors located in a region and these sectors exhibit different vulnerability to the general economy. Economic base theory in regional science research usually divides economic sectors into two categories: population-serving sectors whose products meet the needs of the local communities, and export sectors, which target the export markets and generate additional employment and revenue for a region. According to economic base theory, it is the export sectors of a local economy that bring growth and expansion in terms of revenue and employment to the region (Froeschle, 2005; P. B. Siegel & Johnson, 1995). However, regional business cycle theory, which is another school of thought in regional science that draws heavily from economic base theory, points out that export-oriented industries are more unstable and susceptible to economic fluctuations because these sectors are subject to “a high short-run income elasticity of demand for a region’s export” (P. B. Siegel & Johnson, 1995). If all the economic sectors are classified as stable or unstable sectors in terms of their sensitivity to cyclical changes or systematic risk, the regional business cycle theory suggests that regional differences in sensitivity to economic fluctuations can be attributed to a region’s composition of stable and unstable sectors.

After we recognize economic bases vary in terms of their sensitivity to cyclical fluctuations, it is important to examine how the effects of revenue diversification change when matched with different economic bases. Since the overall sensitivity of an economic base equals the weighted average sensitivity of individual sectors located in a region, if a given region has more unstable or export-oriented sectors in its industrial mix, the economic base is more sensitive with respect to changes in the general economy and employment and income are more prone to declines in demand and production caused by economic downturns. Suppose the local government defines a tax portfolio with the revenue share for each source similar to that of the industry sector mix in the region, the elasticity of the tax portfolio will be fairly high and the government will be more likely to suffer from the negative impacts of great revenue volatility. As a remedy, the government can adopt a diversified tax structure. A more balanced composition of tax revenues can lower the elasticity of the tax portfolio and improve the overall revenue stability by lessening the heavy reliance on elastic revenues generated from the unstable sectors of the area.

From the previous discussion, revenue diversification seems to be a laudable strategy to pursue, considering its perceived positive impacts on fiscal performance and its contribution to revenue stability (under a sensitive economic base). However, the optimum associated with revenue diversification under an insensitive economic base is far from obvious as revenue diversification can also hinder the revenue stabilization.

When an economic base is dominated by stable sectors such as population-serving industries, it implies that the economic base is relatively stable or less responsive to the economic swings. In this case, the level of employment and income generated by the local industries is less volatile over time compared to the former case. If a great portion of the government's tax revenue comes from stable industries, revenue volatility should be less of a concern. On the other hand, if an equally diversified tax structure is applied, the overall elasticity of the tax portfolio will increase as a result of lowering the proportion of relatively stable tax revenue from the inelastic industries. In this case, a naive pursuit of a balanced mix of many unstable small taxes may not be the desirable strategy to pursue because doing so would increase the volatility of overall revenue.

### ***Theoretical Framework for the Determination of Revenue Stability***

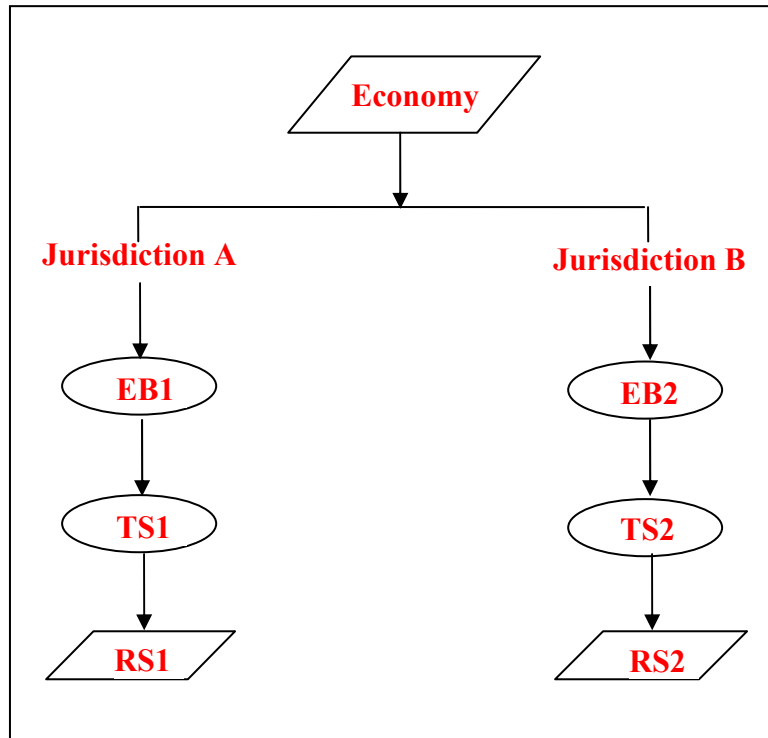
A regional economy is generally exposed to both nonsystematic risks caused by some random factors and systematic risks from the cyclical fluctuations, and both risks can jeopardize revenue stability by affecting the regional employment and income. When both the nonsystematic and the systematic risk are taken into account, economic instability, which can be caused by either or both of the risks, could better describe the nature of an economic base. Regional differences in economic instability can again be attributed to a region's composition of stable and unstable sectors.

As Figure 3.3 demonstrates, economic bases can be conveniently generalized into two types in terms of their nature: unstable economic bases (EB1 or Jurisdiction A), and stable economic bases (EB2 or Jurisdiction B). A region presumably has an unstable economic base if the economy is dominated by unstable sectors. By and large, as illustrated in Figure 3.3 by the flow from EB1 to RS1, revenue diversification under an unstable economic base could enhance revenue stability through the appropriate selection of a tax portfolio. On the other hand, a region is perceived to have a stable economic base if it has more stable sectors in the industry mix. As illustrated in Figure 3.3 in the flow from EB2 to RS2, if a region has a relatively stable economy or the primary tax base is less sensitive to external fluctuations, a less diversified tax structure may bring in more stable revenues than a diversified one. It should be noticed that EB1 and EB2 represent the two extremes of the spectrum of economic instability, and a jurisdiction may fall anywhere along the spectrum.

In order to improve the revenue stability of a government, a diversified tax structure (TS1) is desirable for an unstable economic base (EB1). However, a less diversified tax structure (TS2) is preferable for a stable economic base (EB2). As a result, the desirable levels of revenue stability, represented by RS1 and RS2, can be achieved when the degree of revenue diversification is matched with the instability of the economic base. In summary, revenue stability can be enhanced through choosing an appropriate tax structure in terms of the given characteristics of the economic base.



Figure 3.3



EB1: unstable economic base

EB2: stable economic base

TS1: diversified tax structure for EB1

TS2: less diversified tax structure for EB2

RS: revenue stability

The entire theory is also well connected to Figure 3.1. 1) The general economy and other random factors affect the level of economic outputs of a region; this is manifested by the instability of the regional economic base. 2) The level of regional economic output and the corresponding tax structure determines the level of government revenues. Therefore, both the nature of an economic base and the choice of tax structure are important in achieving the goal of revenue stability.

## CHAPTER 4: COUNTY LEVEL EMPIRICAL ANALYSIS

This chapter empirically examines the interactive effect of revenue diversification and economic base on revenue stability based on the theoretical framework developed in the third chapter with data for 156 Georgia counties. The first section presents the research hypotheses and model specification. The second section introduces the data sources and research design. The third section discusses the measurement and variable selection. The last section concludes with regression results.

### 4.1 Research Hypotheses and Model Specification

In recent decades, local governments have significantly reduced their reliance on property tax and started to use alternative revenue sources to fund their services, which promote the trend of revenue diversification. This chapter aims to investigate the effects of revenue diversification on revenue stability of local governments, particularly county governments<sup>10</sup>. Generally speaking, stability of government revenue is directly influenced by the performance or nature of a regional economy, specifically the stability of employment and income, and local tax structure. Tax structure can be described by the degree of revenue diversification. To account for the influence of regional economy, there are two possible options which can serve as the starting point to investigate the research question: one is to explore the instability of an economic base and the other is to examine the levels of industrial diversification. This study examines the effects of the instability of economic base rather than that of industrial diversification. The primary reason for this is that industrial diversification affects revenue stability in an indirect way, by acting first on local economic stability. Another concern is the theoretical and empirical limitations of industrial diversification in explaining the regional stability as discussed in Chapter 3. Given that the theory from Chapter 3 suggests the effects of revenue diversification on revenue volatility vary conditional on the instability of economic base, there are three testable hypotheses: 1) under a stable economic base, revenue diversification can increase revenue instability; 2) under an unstable economic

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<sup>10</sup> It will be interesting to conduct the similar study at the municipality level. However, fiscal studies at the municipality level are often constrained by data availability. For example, the Bureau of Economic Analysis provides annual personal income data for counties but not cities, and the Census of Governments only has decennial census data which cover all cities every ten years.

base, revenue diversification can reduce revenue instability; 3) the revenue-stabilizing effect of diversification can be enhanced as an economic base becomes more unstable. The following equation is proposed to testify the above three hypotheses with relevant data for Georgia county governments. The measurement issue will be specifically discussed in a later section.

$$\mathbf{RS} = \mathbf{f}(\mathbf{RD}, \mathbf{ES}, \mathbf{RD} * \mathbf{ES}, \mathbf{RC}, \mathbf{POP}, \mathbf{NPR}, \mathbf{FS}) \quad (1)$$

**RS:** revenue instability

**RD:** revenue diversification

**ES:** economic base instability

**RD\*ES:** interaction of revenue diversification and economic base instability

**RC:** tax and revenue capacity

**POP:** population

**NPR:** reliance on non-property tax sources of revenue (local sales tax, excisetax, license tax, and service charges)

**FS:** financial slack

In this model, the factors of interest are revenue diversification, economic base instability and the interaction of revenue diversification and economic base instability. The remaining components control for the conditions that might also affect revenue stability independently of the effects from revenue diversification.

## 4.2 Data and Research Design

The state of Georgia is particularly chosen for the proposed study. The primary reason is data comprehensiveness and convenience: the Georgia Department of Community Affairs (DCA) conducts a fiscal survey called the Report of Local Government Finances (RLGF) on all local governments annually. The survey generates a longitudinal and comprehensive dataset covering the period from 1985 to 2004, which is ideal for the purpose of the analysis. The second reason is that the unique characteristics of the local tax structure in the state of Georgia provide an appropriate context for this study: besides the property tax, Georgia local governments also have alternative revenue sources from local sales taxes, excise and special use taxes, licenses, permits and fees,

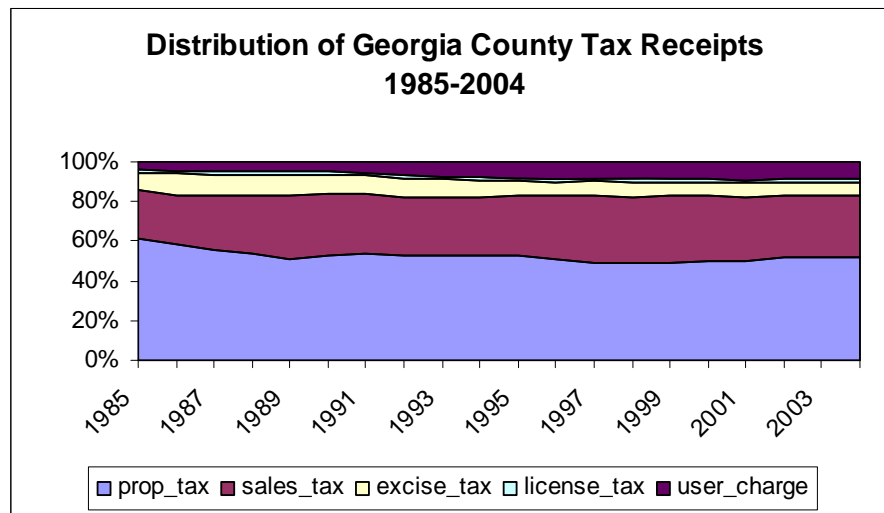
plus service charges and other revenues, which present sufficient diversification in local revenue structures.

The original survey covers all revenue sources for Georgia local governments in great detail<sup>11</sup>. However, the study only focuses on the portion of general own-source revenues (GOSRs), which includes taxes and nontax revenues. To analyze the tax structures of Georgia counties, the study in this part aggregates all GOSRs into five main revenue categories: property taxes, sales taxes, excise and special use taxes, licenses, permits and fees, and service charges and other revenues. The property tax category contains real and personal property taxes, FIFA, penalties and interest, public utilities taxes, motor vehicle taxes, mobile home taxes, intangible taxes, railroad equipment taxes and tax collection fees retained by the tax collector for the government. On average, total property tax revenue declines as a proportion of GOSRs from approximately 61.20% in FY1985 to 51.55% in FY2004. The sales tax group includes local option sales tax (LOST), MARTA public transportation tax and special purpose sales tax. The share of sales tax revenue in counties' GOSRs rose from 24.44% to 31.49% over the same time period. Excise taxes, as the second largest revenue share for municipalities and the third for counties, are calculated as the sum of alcoholic beverage taxes, insurance premium tax, hotel/motel taxes, franchise payments taxes, plus other excise and special use taxes. The share of these revenues in the GOSRs declines from 8.72% to 6.55% from FY 1985 to FY 2004. License taxes account for revenues from business licenses, occupational taxes, alcoholic beverage licenses, building permits, other licenses, permits and fees. In addition to all sorts of charges and fees, Georgia counties also collect nontax revenues from interest earnings on investments, fines, forfeitures, sales of contraband property, and court fees, etc. License tax share changed slightly from 1.52% to 1.67% and user charges with other revenues included increased from 4.12% to 8.74% over the 20 years (1985-2004). Figure 4.1 depicts the relative weights of each of the five segments of total tax revenue in Georgia counties from FY 1985 to FY 2004.

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<sup>11</sup> For details of the survey, refer to:  
[http://www.dca.state.ga.us/development/research/programs/downloads/RLGF\\_Form\\_07Multi\\_Yr\\_PDF.pdf](http://www.dca.state.ga.us/development/research/programs/downloads/RLGF_Form_07Multi_Yr_PDF.pdf)

Figure 4.1



The research design used at the county level model is a similar systems comparative design, which has been used by Hendrick (2002) in her study of revenue diversification's impact on tax effort of municipalities in the Chicago metropolitan region. With this design, all cases are examined within the same system. The main advantage associated with the design, according to Hendrick (2002), is that it controls for regulatory, statutory, and regional economic variation that exist across regions and states. These internal differences can greatly affect many aspects of a local government's financial structure and practices, which are difficult to control for, and often persist in many nationwide studies of local finance. Although there is significant economic variation across Georgia counties and they are difficult to control, the research design used here at least enables all the jurisdictions that are subject to the same institutional constraints and influence, to be compared and analyzed more easily and correctly. The trade-off is the generalizability of the findings to dissimilar systems. This is acceptable in the context of Georgia, because there are some special characteristics associated with the local finance structure, particularly the absence of local income tax and entire home-rule governments, which makes it hard to generalize the results under any circumstances. To provide an alternative viewpoint, a similar model tested with state level data is analyzed and discussed in the next chapter.

In the county level study, a time series cross section dataset is created to estimate the relationship between revenue diversification and revenue stability under different types of economic bases. The model is estimated for the entire population of 156 counties in the state of Georgia<sup>12</sup>. Over the 20-year survey time frame, although not all jurisdictions responded to the survey, over 84 percent of the counties have complete data for all time periods. Altogether, the county level data from RLGF contains an unbalanced panel with 3080 observations which account for 98.7% of the possible county-year observations.

The data source for the financial variables in the county level model is RLGF collected by DCA and it covers the years from 1985 to 2004. Socio-economic data is from the Bureau of Economic Analysis and County Business Patterns provided by U.S. Census Bureau. Since complete County Business Patterns series data are available only for 1986-2005, the study has to constrain its observation period to 19 years to accommodate this limitation. The resulting sample retains 2922 observations from 156 Georgia counties during the 1986-2004 time period<sup>13</sup>. The unit of analysis is an individual county government each year it is observed.

In this analysis, all financial data have been converted to 2000 constant dollars using the implicit price deflator for gross domestic product provided by the Bureau of Economic Analysis. The use of real dollars is important for the reason that inflation can generate different impacts across taxes. Whether the government revenues in real terms are sufficient to maintain an expected level and quality of public services as nominal prices change explains the actual concern for revenue stability (Brien, 2006; Misiolek & Perdue, 1987)

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<sup>12</sup>For the four consolidated county-city governments in Georgia, the Census classifies them as municipal entities, and they are therefore excluded from the analysis.

<sup>13</sup> Altogether, there are 156 observations in 1985. Echols County in Georgia only started to collect license taxes since FY 2003. Running regression with the limited two year observations will generate the perfect fitted value and bias the revenue instability measure used in the study. Therefore, rather than leaving out the entire county, this study only omits the last two year observations (2003-2004) and keeps the remaining observations of the county.

### 4.3 The Variables

#### *Revenue Instability*

Revenue instability is analogous to the concept of financial risk. As White (1983) and Williams et al. (1973) point out, it refers to the short run variability in tax revenue. Revenue instability can be defined as the degree to which actual revenue deviates from predicted revenue. The greater the variation around the expected growth rate, the greater the revenue instability (Gentry & Ladd, 1994).

As for the measurement of revenue instability, there are two strands of thought. The first strand mainly stems from the literature on state revenue cyclical, which focuses on a measure called “revenue-income coefficient” or short- and long-run revenue elasticity (Harold M. Groves & C. Harry Kahn, 1952; Sobel & Holcombe, 1996; Wilford, 1965). This series of measures reveals the cyclical relationship between tax revenue and output but it requires relatively accurate and sophisticated estimations. However, the long-run elasticity measure has been regarded as a better measure of growth or adequacy than cyclical stability (Williams et al., 1973). Short-run revenue elasticity has been found to have no strong correlation with revenue volatility at a given point in time and this measure could only serve as a weak proxy of revenue variability (Dye & Merriman, 2004).

The second measure is the portfolio variance developed by White (1983). This measure defines instability as “the short-run variability of the tax portfolio around its expected growth rate and accounts for both the variance of the trend-adjusted residuals of individual taxes and their covariances” (Gentry & Ladd, 1994). The portfolio variance measure is more desirable for the study in that it captures the overall instability in the revenue sources without separating cyclical variability (Brien, 2006; Holcombe & Sobel, 1995). The measure of revenue instability in this study follows that used by White (1983), which involves three steps:

*Step one: unit standard deviation*

The instability of a tax can be measured by the unit standard deviation, which takes into account dispersion around the predicted tax revenue<sup>14</sup>. The following equation gives the formula to calculate the unit standard deviation:

$$\sigma_i = \sqrt{\frac{\sum_{t=1}^m \left[ \frac{R_{it} - \hat{R}_{it}}{R_{i\bullet}} \right]^2}{m - 1}} \quad (2)$$

Where  $\sigma_i$  is the standard deviation of the  $i$ th tax,

$R_{it}$  is revenue from the  $i$ th tax in period  $t$ ,

$\hat{R}_{it}$  is expected revenue from the  $i$ th tax in period  $t$ ,

$R_{i\bullet}$  is mean revenue of the  $i$ th tax for period 1 through  $m$ , and

$m$  is the number of time periods included in the analysis.

To use this equation, the key is to estimate  $\hat{R}_{it}$ , the expected revenue for the  $i$ th tax in year  $t$ , which leads to the second step.

*Step two: projected revenue growth*

The expected revenue growth can be estimated with the following equation:

$$\log R_{it} = a + bt + e_{it} \quad (3)$$

Where  $R_{it}$  is revenue from the  $i$ th tax in year  $t$ ,

$t$  is the time variable indicating year,

$a$  and  $b$  are regression coefficients, and

$e_{it}$  is a random error term.

This is a trend regression and it is assumed that no major change in tax rate or tax base occurs over the period of the study. Also, the variance of  $e_{it}$  can be allowed to vary over time. With the regression coefficient  $b$ , we can obtain the projected revenue  $\hat{R}_{it}$ , and then the unit standard deviation  $\sigma_i$  can be calculated from the difference between actual and estimated revenues following the formula in equation (2). There might be a concern that the relationship between dependent variable and time variable could be quadratic. Given

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<sup>14</sup> The unit standard deviation is essentially the coefficient of variation without converting to a percentage term (White, 1983).



that the linear term already captures the majority (90%) of the effect of the quadratic term, it will not significantly affect the variable of interest, the predicted value of  $R_{it}$  even without including the quadratic term of time variable.

*Step three: the overall instability for a tax structure*

Unit standard deviation only deals with the instability of a single tax. To measure the instability of a tax structure which contains several taxes, we need to account for the variance of individual taxes and the covariance ( $\sigma_{ij}$ ) between taxes. Since the covariance term can be defined as  $\sigma_{ij} = \rho_{ij}\sigma_i\sigma_j$ , the measure of the tax portfolio instability  $\sigma^2_T$  at a point in time is expressed as:

$$\sigma^2_T = \sum_{i=1}^n \sum_{j=1}^n R_i R_j \rho_{ij} \sigma_i \sigma_j \quad (4)$$

where  $R_i$  and  $R_j$  are the level of revenue from tax  $i$  and  $j$ ,

$\sigma_i$  and  $\sigma_j$  are the standard deviations of taxes  $i$  and  $j$ , and

$\rho_{ij}$  is the correlation coefficient between the two taxes.

Here the revenue instability is estimated as the above tax portfolio variance in millions of squared dollars to scale the resulting coefficients. Note that this measure is in squared dollars, which is a natural unit of risk but not an intuitive unit of everyday observation.

***Revenue Diversification***

An early prescription (1960-1975) for revenue diversification suggested a 20 to 25 percent tax share for individual income tax, the general sales tax, and the local property tax (Suyderhoud, 1994). In the early 1980s, this measure was modified to take into account user fees and severance taxes but still kept the 20 to 35 percent of state and local tax share for the personal income tax and 20 to 30 percent each for the general sales and local property taxes (Suyderhoud, 1994). A later measure developed by Shannon offers a balanced tax system which assigns a 25 to 43 percent weight to property taxes, general sales taxes and personal income taxes (Carroll, 2005; Shannon, 1987). However, Shannon still failed to consider some other important revenue sources other than the “big three” taxes. All of these early measures of diversification are conceptual and prescriptive in nature. As a more quantitative way to measure the degree of diversification, the

Hirschman-Herfindahl Index (HHI) and its related measures have been widely used in the recent research on revenue diversification.

The Hirschman-Herfindahl Index (HHI)<sup>15</sup> has been widely used in the field of industrial organization concentration research to measure risk-reducing revenue diversification. Suyderhoud (1994) developed a revised measure of revenue diversification based on the HHI. The revised measure of Suyderhoud indicates how diversified a particular revenue structure is relative to a theoretical maximum and it incorporates four own-source revenue categories: property taxes, personal and corporate income taxes, general sales taxes, and all other revenues including nontax revenues. The measure of revenue diversification used in this study is similar to that of Suyderhoud, and it incorporates the five revenue categories as discussed in the previous section. The measure is defined as the following:

$$RD = \frac{1 - \sum_{i=1}^5 R_i^2}{0.8} \quad (5)$$

where  $R_i$  is the revenue share<sup>16</sup>. The degree of diversification as measured by this index depends on both the number of revenue sources and the proportion of each revenue type (Chang, 1994). The higher values of RD imply the greater levels of revenue diversification among revenue structures. An index value of one means the maximum diversification or the total revenue of a government is evenly distributed among the selected revenue categories and zero shows a government solely relies on one category of revenue. Since this variable is used to indicate the degree of diversification in a tax structure and it is interacted with the instability of an economic base, I will defer discussing its expected effects to the section that introduces the measurement of economic base instability.

There are three obvious advantages associated with this improved measure, as noted by Suyderhoud (1994): first, it is based on the HHI, a well-accepted measure of concentration. Second, rather than an absolute measure of concentration level, it

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<sup>15</sup> HHI is calculated by summing the squares of each revenue share (Suyderhoud, 1994).

<sup>16</sup> This equation can be expressed in an alternative way as  $RD = (1 - \sum R_i^2) / (1 - \sum R_i^{*2})$ , where  $R_i^* = 0.2$  in the context of this study when a government achieves the maximum diversification under the scenario of five revenue categories.

considers the relative position of a revenue structure to its maximal diversification scenario. Third, it is flexible and can be applied to any classification of revenue.

There are two cautions when we interpret the measure according to Carroll (2005). First, this index assumes that each jurisdiction has the equivalent ability to diversify its revenue sources. However, this might not be the case when revenue or expenditure limitations are imposed and referenda for tax policy changes are required. Since the model focuses on the Georgia local governments, which are presumably subject to the similar institutional constraints imposed by the state legislature, the concern of equivalent diversification ability can be addressed by the similarity in the policy environment. Second, this measure assumes that each government has all of the revenue categories used for the calculation, which is certainly not the case. This problem will arise when one jurisdiction that does not collect nontax revenues and a jurisdiction that does not impose a sales tax could possibly have an equivalent level of revenue diversification, while the volatility of the two revenue structures are significantly different. In such a case, it would be difficult to know how differently revenue diversification contributes to fiscal performance given the two different revenue structures. As a remedy for this issue, variables of revenue shares from four non-property tax sources (local sales taxes, excise taxes, license taxes, and service charges) are included as controls in the model. Additional discussion of these variables is provided in the later section.

### ***Economic Base Instability***

As discussed in the third chapter, regional economic output and employment fluctuate when a regional economy experiences business cycles or random shocks, and so do the tax revenues of a government regardless the design of its tax structure. However, the differing nature of economic bases makes the economic activities in a region more or less subject to business cycles or other external fluctuations. Here the nature of an economic base is reflected by regional economic instability (REI).

Consensus has developed in terms of the measurement of economic instability. “Although they differ somewhat in their treatment of random, seasonal, trend, and cyclical components, each measures regional economic instability (REI) using a variance-based statistic applied to employment data over time” (Brewer, 1985). For

example, the measure of Kort (1981) isolates and measures the cyclical component of an employment time series. Although Kort claimed to control for random components, he did not explain which time series technique he used to achieve the purpose. The measure of economic instability used in this study is the coefficient of variation of employment developed by Conroy (1972, 1975)<sup>17</sup>. Jackson(1984) and Siegel (1966) also used the similar measure in their regional industrial diversification studies. The computational formula is defined as follows:

$$ES_k = \sqrt{\frac{\sum_{t=1}^T \left[ \frac{Y_t^k - \widehat{Y}_t^k}{\overline{Y}_t^k} \right]^2}{T - 1}} \quad (6)$$

Where  $ES_k$  is economic instability for region k

$Y_t^k$  is observed employment in county k for period t,

$\widehat{Y}_t^k$  is employment in that county and period predicted by the trend equation,

$\overline{Y}_t^k$  is the arithmetic average of the respective time series, and

$T$  is the number of time periods included in the analysis.

The predicted employment levels are derived from a time trend regression of the form:

$$\log Y_t^K = a + bt + e_t^k; t = 1 \dots T \quad (7)$$

Where  $Y_t^k$  and  $t$  follow that in the previous equation,

a, and b are regression coefficients, and

$e_t^k$  is a random error term.

Here the estimation uses county level annual employment data for the state of Georgia from 1986 through 2004. Since economic instability can be measured by the variation from a predicted level of employment, “the index may be roughly interpreted as the standard deviation of the fluctuations in employment expressed as a percentage of the mean employment level for that region for the period under consideration” (Jackson,

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<sup>17</sup> Different from Conroy (1972, 1975), this study uses annual employment data rather than monthly employment data.

1984) and it generates a unique value for each county over time.  $\widehat{Y}_t^k$  rather than  $\overline{Y}_t^k$  is used in equation (6) “to reflect the variance around a growth trend rather than absolute variance over the time period. This reflects the view that growth is a desirable regional attribute” (Jackson, 1984). This REI measure is practically identical to the one used by Kort (1981)<sup>18</sup>. However, the procedure outlined in equation (6) and (7) only isolates the trend component. Random and cyclical components still remain in the original employment series. The economic instability caused by random and cyclical components are usually associated with nonsystematic and systematic risk of revenue. As such, it is reasonable to retain and measure these two components of an economic time series in terms of the context of this study. Regarding the treatment of the seasonal component, there is inconsistency in the past literature: Siegel (1966) and Cutler and Hansz (1971) chose to deseasonalize the series but Conroy (1975) prefer retaining the seasonality. The exclusion of seasonality, according to Conroy (1975), implies that seasonal fluctuations in economic activities are of no concern to the policymaker. Apparently, the seasonal variation in the regional economy will affect some tax bases (e.g. sales tax), if not all, and governments are expected to deal with the revenue instability caused by seasonality. Since the index is derived from annual employment data and annual data is not affected by the sub-annual pattern, e.g. seasonal variation, seasonality is no longer a concern. Therefore, it is reasonable for the analysis to emphasize the instability resulting from random and cyclical components in the series and it is appropriate to use the coefficient of variation of the trend-adjusted residuals of annual employment data as the economic instability measure. Due to the way that the measure of economic instability is constructed, the value of the index is constant throughout the observation period for each county but it varies across counties.

As the theory regarding the determination of revenue stability in Chapter 3 suggests, the effect of revenue diversification on revenue volatility may change depending upon the nature of the economic base which is measured by economic instability. An interaction term of diversification index and economic instability is

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<sup>18</sup> The only difference from the measure used by Kort (1981) is this measure adjust the numerator of (6)  $(Y_t^k - \widehat{Y}_t^k)$  by  $\overline{Y}_t^k$  rather than  $\widehat{Y}_t^k$ .

included in the model to investigate this conditional relationship. The regression coefficients for RD and ES reflect the main effects and the regression coefficient for RD\*ES shows the interaction effects. The coefficient for RD is the effect of RD on revenue instability when ES=0 and it is expected to be positively associated with revenue instability. The coefficient for ES is the effect of ES on revenue instability when RD=0 and the expected effect on revenue instability is also positive. Similarly, the coefficient for RD\*ES is the effect of the interaction between RD and ES on revenue instability. The change in revenue instability caused by the interaction effect is the coefficient times the interaction term, which always depends on both RD and ES and in particular is zero if either RD=0 or ES=0. Since the ES is assumed to be a given attribute, the coefficient indicates the additional effect of revenue diversification on revenue instability under different economic bases. Given the hypothesis states that the revenue-stabilizing effect of diversification can be enhanced as an economic base becomes more unstable, the interaction term RD\* ES is expected to be negatively related to revenue instability.

### ***Other Variables***

To isolate the effects of the key explanatory factors in the study from other conditions that also affect the dependent variable, additional control variables need to be included into the model. To control for the influence of the varying tax capacity of a local government on its revenue stability, log of per capita personal income of a county is chosen to measure revenue capacity. Since income provides the best base from which taxes are taken, thus it can appropriately define tax capacity and overall wealth of a jurisdiction (Hendrick, 2002). However, the expected relationship between income and revenue instability is unknown.

The size of a county measured by population (in thousands) and the square of population are included in the equation. The population variable is supplemented by a quadratic term in that there also might be a quadratic relationship between population and revenue instability. A region's population size could be a good proxy for economic diversity, and based on the explicit assumption of spatial heterogeneity, region size is hypothesized to have a positive relationship with economic stability (P. B. Siegel & Johnson, 1995). Therefore, the population should be negatively correlated with revenue

instability, but the marginal impact could increase or decrease—the quadratic term could be positive or negative.

In addition to revenue diversification, financial slack of a government, as discussed earlier, can also function as a means to alleviate the concern of revenue instability and uncertainty. Slack resources are important in that they enhance the flexibility and ability of organizations to adapt to an uncertain or adverse environment, such as volatile revenue streams and limited options for raising revenue, by providing an alternative revenue source (Hendrick, 2002). From this perspective, slack resources might weaken the effect of revenue diversification on fiscal performance and presumably, they may increase revenue instability. To measure slack resources, annual general revenue surplus (in million dollars) indicated as the difference between general revenues<sup>19</sup> and general expenditures<sup>20</sup> at the end of the fiscal year is used as a proxy of financial slack for county governments in Georgia and it is anticipated to be positively related to revenue instability.

As discussed in the previous section, the variables of revenue shares for sales taxes, excise taxes, license taxes, and service charges in the county case are used as controls to distinguish their different contributions to revenue stability given the chances that two distinct tax portfolios may have the same value of diversification index. Here the revenue shares are measured as the percent of general own source revenues from each non-property tax source with property taxes as the omitted category and their expected directions are unclear. These coefficients estimate the effect of each source relative to the effect of property taxes.

Table 4.1 provides the detailed description of variables, expected signs of coefficients and data source.

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<sup>19</sup> General revenues include tax revenues, intergovernmental revenues, service charges and other revenues.

<sup>20</sup> General expenditures include expenditures from governmental funds and intergovernmental expenditures

Table 4.1: Variable Information for Revenue Stability Estimation (County Model)

Variable	Description	Expected Signs	Data Source
<b>RS</b>	Revenue instability measured by portfolio variance in million squared dollars (White,1983)		DCA
<b>RD</b>	Revenue diversification measured by modified Hirschman-Herfindahl Index	+	DCA
<b>ES</b>	Regional economic instability measure by coefficient of variation of county employment	+	County Business Patterns (U.S. Census Bureau)
<b>income</b>	Log of per capita personal income	?	Bureau of Economic Analysis
<b>pop_ths</b>	Population in thousands	-	DCA
<b>pop_ths_sq</b>	The square of pop_ths	?	DCA
<b>stxshare</b>	Percent revenue from sales tax	?	DCA
<b>etxshare</b>	Percent revenue from excise tax	?	DCA
<b>ltxshare</b>	Percent revenue from license tax	?	DCA
<b>servshare</b>	Percent revenue from service charges and other sources	?	DCA
<b>surplus</b>	General revenue surplus in million dollars	+	DCA

#### 4.4 Regression Results

Given the panel structure of the data set, a common way of estimation is to use fixed or random effect models which control for average unchanging levels of explanatory variables and unobserved factors. Since there is a strong correlation (-0.9289) between the residuals and the predicted values based on other explanatory variables in the model, which would make random effects estimates biased, the fixed effect model is preferred. The Breusch-Pagan/Godfrey LM test revealed the existence of heteroskedasticity. Therefore, the model is estimated using a fixed effect model with robust standard errors. Since economic instability is a non-varying county characteristic, it becomes part of the fixed effect and does not appear in the fixed effects estimation. It is impossible to ask what the effect of economic instability would be in these data by using fixed effects estimation. Standard ordinary least squares (OLS) regression with robust standard error generates estimates which have a weighted average effect from either the



averages, the changes, or both of each individual explanatory variable and it recovers the effect of a variable like economic instability. However, the OLS estimates fail to control for the fixed differences and thus bias the estimates when the residuals are correlated with explanatory variables (Wooldridge, 2005), which is the case here. Therefore, the OLS regression results are provided (in Table 4.4) but not discussed here except for the variable of economic instability.

Table 4.2 gives the descriptive statistics of all variables used in the analysis. As we can see from the table, the mean value of revenue diversification is 0.723 which implies that the Georgia counties have fairly diversified revenue structures as a whole. From the revenue share variable, we can see that the omitted category, property taxes still account for about 52% of the GOSRs, which is still the largest share among all revenue sources. The second largest share, sales taxes, take about 31% of the GOSRs.

Table 4.2: Descriptive Statistics of County Model

Variable	Mean	Std. Dev.	Min	Max
<b>RS</b>	105.528	719.248	0.002	10759.020
<b>RD</b>	0.723	0.113	0.140	0.923
<b>ES</b>	0.107	0.105	0.022	1.021
<b>RD*ES</b>	0.076	0.075	0.011	0.927
<b>pop_ths</b>	44.092	95.542	1.788	825.431
<b>pop_ths_sq</b>	11069.16	59783.34	3.197	681336.4
<b>income</b>	9.734	0.284	8.955	10.761
<b>stxshare</b>	0.306	0.132	0.000	0.776
<b>etxshare</b>	0.084	0.054	0.000	0.820
<b>ltxshare</b>	0.015	0.015	0.000	0.206
<b>servshare</b>	0.073	0.056	0.000	0.598
<b>surplus</b>	0.087	12.731	-108.143	232.401

Note: the above statistics are calculated based on the same number of observations that are used to estimate parameters in Table 4.3, Table 4.4 and Table 4.5.

The fixed-effect regression results of the county level model are listed in Table 4.3. All of the variables except for the square of population show statistical significance at the five percent level (revenue diversification, the interaction of revenue diversification and instability of economic base, population, income, sales tax share, excise tax share, license tax share, service charge share and surplus). As expected, revenue diversification by itself is positively related to revenue volatility in the absence of economic base instability. To put it in another way, a diversified revenue structure tends to increase the overall risk of revenue when the economic base of a county is entirely stable or immune to general economic fluctuations and other external shocks. Similarly, the OLS regression result as is shown in Table 4.4 suggests that the economic base instability is positively correlated with revenue instability when there is a minimum level of diversification in a county's revenue structure. This indicates that the more unstable the economic base, the more volatile the tax revenues if a county solely relies on one revenue source.

Table 4.3: Fixed-effects Estimates for Revenue Instability of Georgia Counties (in Million Squared Dollars)

Variable	Coef.	Robust Std. Err.	t	P> t
<b>RD</b>	994.67	252.28	3.94	0.000
<b>RD*ES</b>	-1989.20	512.11	-3.88	0.000
<b>pop_ths</b>	13.62	2.64	5.16	0.000
<b>pop_ths_sq</b>	0.00	0.00	0.27	0.788
<b>income</b>	-266.22	52.04	-5.12	0.000
<b>stxshare</b>	405.52	157.50	2.57	0.010
<b>etxshare</b>	-1204.66	353.14	-3.41	0.001
<b>ltxshare</b>	-4927.56	1395.73	-3.53	0.000
<b>servshare</b>	-513.00	262.41	-1.95	0.051
<b>surplus</b>	14.42	2.57	5.61	0.000
<b>Constant</b>	1605.12	410.59	3.91	0.000

---

Number of observation = 2922; Number of groups = 156  
Observations Per Group (Min = 16; Avg = 18.7; Max = 19)  
R-squared: within = 0.3801; between = 0.7188 ; overall = 0.5445  
corr(u\_i, Xb) = -0.9289  
F( 10,2756) = 12.64  
Prob>F = 0.0000

---

Table 4.4: OLS Regression Estimates for Revenue Instability of Georgia Counties (in Million Squared Dollars)

Variable	Coef.	Robust Std. Err.	t	P> t
<b>RD</b>	687.83	207.81	3.31	0.001
<b>ES</b>	1482.83	337.34	4.40	0.000
<b>RD*ES</b>	-1441.36	371.07	-3.88	0.000
<b>pop_ths</b>	3.47	0.93	3.72	0.000
<b>pop_ths_sq</b>	0.00	0.00	1.87	0.062
<b>income</b>	-77.50	39.53	-1.96	0.050
<b>stxshare</b>	-119.86	102.22	-1.17	0.241
<b>etxshare</b>	-774.62	176.54	-4.39	0.000
<b>ltxshare</b>	-1662.83	645.67	-2.58	0.010
<b>servshare</b>	-118.89	211.92	-0.56	0.575
<b>surplus</b>	6.60	3.56	1.85	0.064
<b>Constant</b>	257.24	324.77	0.79	0.428

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Number of observation = 2922  
R-squared = 0.5782  
F( 11, 2910) = 25.29  
Prob>F = 0.0000

---

Since revenue diversification and economic base instability are measured on a scale base, a one-unit change in both variables can be interpreted as a change of one standard deviation of each variable. According to Table 4.3, a one standard deviation (0.1) increase in revenue diversification, for example, RD moving from the mean RD 0.7 to 0.8, can lead to an average increase in revenue variability by 99.47 ( $994.67 \times 0.1$ ) million squared dollars over time. In terms of Table 4.4, revenue instability increases on average by a variance of 148.28 ( $1482.833 \times 0.1$ ) million squared dollars for every unit increase (0.1) in economic base instability (moving from the mean ES 0.1 to 0.2).

Although the main effects of these two variables could happen alone in rare cases, it is less meaningful or may even be misleading to interpret the effects of revenue diversification and economic base instability in isolation. As the effects of revenue diversification on revenue instability are hypothesized to vary depending upon economic base instability, it is important to consider the interaction effect (RD\*ES) as well. According to Table 4.3, the negative coefficient for the interaction term shows that the

revenue stabilizing effect from revenue diversification increases in counties as their economic base instability gets higher, which is consistent with the hypothesis. When the interaction between the instability of a county's economic base and revenue diversification is taken into consideration, the positive effect of revenue diversification on revenue volatility reduces by 19.89 ( $-1989.2 \times 0.1 \times 0.1$ ) million squared dollars on average for every unit increase in the interaction term ( $0.1 \times 0.1$ ) when both RD and ES are equal to zero. The effect is greater, the greater either RD or ES or both are, but the effect is always a decrease.

To better understand the dynamics of the overall effect of revenue diversification on revenue risk, including the main effect of RD and the interaction effect of revenue diversification and economic base instability, a general way is to derive the marginal effect of revenue diversification across the range of varying economic base instability. The marginal effect of revenue diversification on revenue volatility is presented in Table 4.5 and it is computed in terms of the economic base instability in different percentiles found in Georgia counties<sup>21</sup>. As can be seen from the table, revenue diversification has a positive effect on revenue variability for most Georgia counties along the ES spectrum (up to the 95th percentile) while it has a negative effect from about the 99<sup>th</sup> percentile. The positive effect on revenue volatility is most statistically significant for counties that are at or below the 95th percentile of economic base instability or when economic base instability is lower than 0.26. For counties in these categories, as is shown in Table 4.5, every 0.1 increase in revenue diversification is estimated to at least increase revenue instability by 47.9 million squared dollars. The negative effect is found to be statistically insignificant for counties at the higher end of the ES spectrum (the 99th percentile and above) or when economic base instability is greater than 0.57 though the negative effect is more desirable for governments with the stability concern.

As is shown in Table 4.5, revenue diversification substantially increases revenue risk for most counties in Georgia. However, the magnitude of the positive effect decreases as the economic base instability increases eventually becoming negative. The

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<sup>21</sup> The marginal effect = coefficient of RD \* unit change of RD + coefficient of the interaction term \* unit change of RD \* ES. For example, if a county falls in the first percentile of ES (0.0256), the marginal effect of one unit increase of RD on Revenue Instability is  $0.1 \times 994.67 - 1989.20 \times 0.1 \times 0.0256 = 94.38$  million squared dollars.

findings strongly support the hypotheses that revenue diversification increases revenue instability when a jurisdiction has a stable economic base and the revenue-stabilizing effect of diversification can be enhanced as an economic base gets more unstable. However, there is insufficient evidence that revenue diversification reduces revenue instability when a jurisdiction has an unstable economic base. This may be explained by the fact that a majority of the Georgia counties are located in rural areas whose production mainly meets the needs of the local population, and thus their economic bases are relatively stable compared to other parts of the country. It is a reasonable speculation that revenue diversification would significantly reduce revenue instability if more Georgia counties had unstable economic bases.

It should be noted that the impact of revenue diversification on the revenue instability along the ES spectrum is working through a gradual and continuous process. When an economic base gets more unstable, the positive effect of revenue diversification on revenue instability decreases until it passes a threshold, and then the effect reverses: revenue diversification reduces revenue variability from that point on, though the effect is not statistically significant. The dynamic effect of revenue diversification as illustrated by Figure 4.2 confirms the view that the revenue-stabilizing effect of diversification becomes more salient as the instability of a local economic base moves from low to high, which is manifested by the downward trend of revenue variability along the ES spectrum.

For the control variables, income is negatively correlated with revenue instability. One percent increase of per capita personal income can result in an average decrease in revenue variability by 266.22 million squared dollars. The effect of income implies that greater tax capacity helps to reduce revenue risk of county governments in Georgia. Revenue shares from non-property tax sources are all found to be important factors in changing the level of revenue risk relative to property taxes but with different directions. A one percent increase in sales tax share is associated with an average increase of revenue instability by 405.52 million squared dollars, while a one percent increase in excise tax share, license tax share and service charge share lead to an average decrease of revenue instability by 1204.66, 4927.56 and 513 million squared dollars respectively. General revenue surplus also contributes to the revenue instability but at a small magnitude. Every million squared dollars increase in revenue surplus can only increase

revenue instability by 14.42 million squared dollars on average. A reasonable explanation is Georgia counties on average do not operate at a significant amount of revenue surplus (by a mean of 0.087 million dollars), which implies revenue surplus as a proxy for slack resources is not sufficient in magnitude to play its expected role.

It is surprising to find the size of population is positively related to revenue instability, which contradicts the expectation. Revenue instability increases by 13.62 million squared dollars on average for every thousand increase in population. This contradictory result might be explained by the effect of growth: a jurisdiction with rapidly growing population will have more variance in revenue than otherwise (Dye & Merriman, 2004). Stated another way, jurisdictions experiencing high growth may prefer more elastic revenue structures to provide adequate revenue to meet the expanding needs for public services. Another variable related to jurisdiction size, the square of population does not show statistical significance in predicting the level of revenue instability, which indicates that the effect of population is approximately linear.

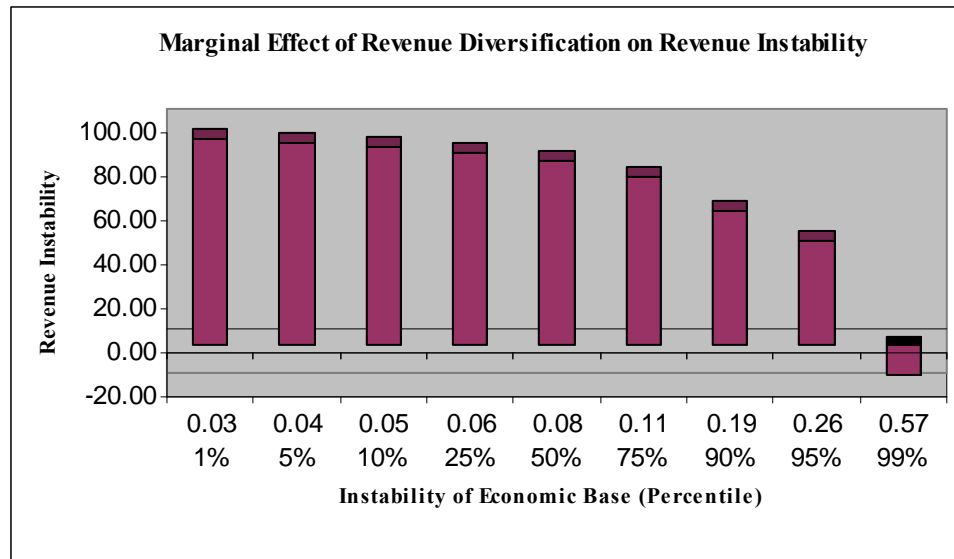
Table 4.5: Marginal Effect of Revenue Diversification on Revenue Instability of Georgia Counties (in Million Squared Dollars)

Percentiles of ES	ES	F-value	Prob>F	Marginal Effect of RD
1%	0.0256	15.47	0.0001	94.38
5%	0.0368	15.43	0.0001	92.15
10%	0.0460	15.40	0.0001	90.31
25%	0.0592	15.34	0.0001	87.69
50%	0.0771	15.26	0.0001	84.12
75%	0.1136	15.03	0.0001	76.87
90%	0.1906	14.21	0.0002	61.55
95%	0.2592	12.74	0.0004	47.90
99%	0.5656	1.78	0.1817	-13.04

Note: 1) N = 2922

2) Marginal effect is calculated based on fixed-effect estimates of RD and RD\*ES

Figure 4.2



As a summary, the findings of the county level analysis support two of the three hypotheses. Revenue diversification significantly increases the revenue instability of a county that has a stable economic base. In addition, the revenue stabilizing effect of diversification is enhanced as an economic base becomes more unstable. However, revenue diversification decreases the revenue instability of a county that has an unstable economic base, but the effect lacks statistical significance.



## CHAPTER 5: STATE LEVEL EMPIRICAL ANALYSIS

This chapter empirically examines the interactive effect of revenue diversification and economic base on revenue stability based on the similar theoretical framework developed in the third chapter with data for U.S. state governments. The first section presents research hypotheses and model specification. The second section introduces the data sources. The third section discusses the measurement and variable selection. The last section concludes with regression results.

### 5.1 Research Hypotheses and Model Specification

Different from local governments, state governments have devolved property tax to local governments since the beginning of the twentieth century (Howe & Reeb, 1997). Since the era of tax revolt in the 1970s, although the primary target of the taxpayer opposition was the local property tax, state governments have been constrained by limitations on revenue and expenditure or the size of their growth (Joyce & Mullins, 1991). The relegation of property tax to localities and the limitations on revenue and expenditure resulting from tax revolt largely changed the fiscal environment of state governments. Therefore, the move toward reliance on multiple revenues in state governments behaved in a different way than it does in the local government. The goal of this chapter is to explore the effects of revenue diversification on revenue stability of state governments.

Provided that the theory developed in Chapter 3 suggests the effects of revenue diversification on revenue volatility vary conditional on the instability of economic base, three testable hypotheses are raised: 1) under a stable economic base, revenue diversification increases revenue instability; 2) under an unstable economic base, revenue diversification reduces revenue instability; 3) the revenue-stabilizing effect from diversification can be enhanced as an economic base becomes more unstable. The following equation is proposed to test the above three hypotheses with relevant data for U.S. state governments. The measurement issue will be specifically discussed in a later section.

$$RS = f(RD, ES, RD * ES, RC, POP, NSR, FS, PC) \quad (1)$$

**RS:** revenue instability

**RD:** revenue diversification

**ES:** elasticity of economic base

**RD\*ES:** interaction of revenue diversification and economic base instability

**RC:** tax and revenue capacity

**POP:** population

**NSR:** reliance on non-sales tax sources of revenue (property tax, license taxes, income taxes, and general charges)

**FS:** financial slack

**PC:** political controls

In this model, the factors of interest are revenue diversification, economic base instability and their interaction. The other components control for the conditions that might also affect revenue stability, independent of the effects from revenue diversification. The influence of party competition is taken into account only in the state level model for the reason that the political data is not available at the local level, although political heterogeneity greatly exists across states and within a particular state.

## **5.2 Data and Research Design**

To further examine the proposed hypotheses which have already been tested in the context of Georgia county governments, a similar model specification as discussed above is applied to test with the data for state governments. Government Finances from U.S. Census Bureau provides comprehensive and longitudinal state revenue data which covers the years from 1957 to 2004. This state area data base provides information of all revenue sources for state governments in great detail. However, the study only focuses on the portion of general own-source revenues (GOSRs), which includes taxes and nontax revenues<sup>22</sup>. To analyze the tax structures of states, this state level study aggregates all GOSRs into five main revenue categories for state government: property taxes, income

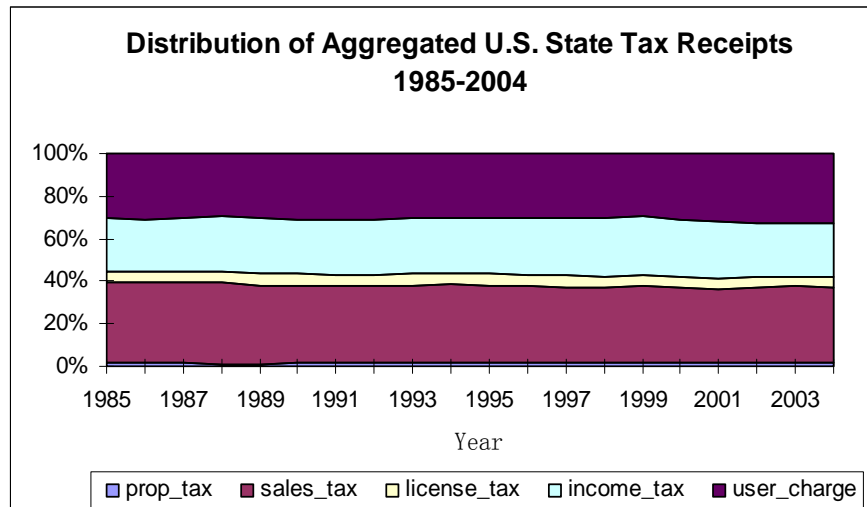
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<sup>22</sup> For detailed information regarding all revenue categories, please refer to \\Govs05\PEB\Historical Data\Finance\Publication\_Data\Documentation\Finance\_Publication\_Data\_Guide.xls

taxes, total sales and gross receipts taxes with general sales and selected sales taxes included, license taxes, and all other revenues including general charges<sup>23</sup>.

Figure 5.1 depicts the relative weights of each of the five segments of total GOSRs based on the 50 states aggregated data from 1985 to 2004. The same time period (1985-2004) is chosen so as to compare with the county level analysis. On average, total property tax revenue remained relatively stable as a proportion of the GOSRs from approximately 1.29% in 1985 to 1.92% in 2004. The share of total sales and gross receipts in states' GOSRs decreased from 37.97% to 35.39% over the same time period. State income tax as a share of the GOSRs is relatively stable, which ranged from 25.17% to 24.78% from 1985 to 2004. License tax share changed slightly from 5.41% to 5.13%. The share of user charges and other revenues increased from 30.16% to 32.80% over the 20 years. In all, the shares of each of the five revenue components were relatively stable from 1985 to 2004, which implies that there were no dramatic changes in the state revenue structures on average.

Figure 5.1



The data for the financial variables in the state level analysis come from U.S. census of governments and National Association of State Budget Officers (NASBO). The political variable data are from National Conference of State Legislatures (NCSL). The

<sup>23</sup> Besides general charges, all other revenues also include death and gift tax and taxes NEC and miscellaneous revenues.

sources of socio-economic data are Bureau of Economic Analysis and County Business Patterns provided by U.S. Census Bureau. Since complete County Business Patterns series data are available only for 1986-2005, the study has to constrain its observation period to 19 years (1986-2004) to accommodate this limitation.

In the state level model, a time series cross section dataset is created to estimate the relationship between revenue diversification and revenue stability under different types of state economic bases. Alaska and Wyoming are excluded because of their unusual tax structure: both states heavily rely on severance taxes due to natural resources (Misiolek & Harold, 1988). Nebraska is not included for its unique unicameral and nonpartisan state legislature. The resulting sample retains 893 observations from 47 states during the 1986-2004 time period. The unit of analysis is an individual state government each year it is observed.

Similar to the county level analysis, all financial data have been converted to year 2000 constant dollars using the implicit price deflator for gross domestic product provided by the Bureau of Economic Analysis.

### **5.3 The Variables**

#### ***Revenue Instability***

Instability can be defined as the degree to which actual revenue deviates from predicted revenue. The greater the variation around the expected growth rate, the greater the revenue instability (Gentry & Ladd, 1994). Compared to growth, instability is a short-run phenomenon (White, 1983; Williams et al., 1973).

The measure of revenue instability in this study is the portfolio variance developed by White (1983) which defines instability as “the short-run variability of the tax portfolio around its expected growth rate and accounts for both the variance of the trend-adjusted residuals of individual taxes and their covariances” (Gentry & Ladd, 1994). The portfolio variance measure is chosen for the study in that it captures the overall instability in the revenue sources without separating cyclical variability (Brien, 2006; Holcombe & Sobel, 1995). The derivation of the portfolio variance involves three steps: *Step one: unit standard deviation*

The instability of a tax can be measured by the unit standard deviation, which measures variation around the predicted level of tax revenue<sup>24</sup>. The following equation gives the formula to calculate the unit standard deviation:

$$\sigma_i = \sqrt{\frac{\sum_{t=1}^m \left[ \frac{R_{it} - \hat{R}_{it}}{R_{i\bullet}} \right]^2}{m - 1}} \quad (2)$$

Where  $\sigma_i$  is the standard deviation of the  $i$ th tax,

$R_{it}$  is revenue from the  $i$ th tax in period  $t$ ,

$\hat{R}_{it}$  is expected revenue from the  $i$ th tax in period  $t$ ,

$R_{i\bullet}$  is mean revenue of the  $i$ th tax for period 1 through  $m$ , and

$m$  is the number of time periods included in the analysis.

To use this equation, the key is to estimate  $\hat{R}_{it}$ , the expected revenue for the  $i$ th tax in year  $t$ , which leads to the second step.

#### *Step two: projected revenue growth*

The expected revenue growth can be estimated with the following equation:

$$\log R_{it} = a + bt + e_{it} \quad (3)$$

Where  $R_{it}$  is revenue from the  $i$ th tax in year  $t$ ,

$t$  is the time variable indicating year,

$a$  and  $b$  are regression coefficients, and

$e_{it}$  is a random error term.

This is a trend regression and it is assumed that no major change in tax rate and tax base over the period of my study. Also, the variance of  $e_{it}$  can be allowed to vary over time.

With the regression coefficient  $b$ , we can obtain the projected revenue  $\hat{R}_{it}$ , and then the unit standard deviation  $\sigma_i$  can be calculated from the difference between actual and estimated revenues following the formula in equation (2).

#### *Step three: the overall instability for a tax structure*

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<sup>24</sup> The unit standard deviation is essentially the coefficient of variation without converting to a percentage term (White, 1983).

Unit standard deviation only deals with the instability of a single tax. To measure the instability of a tax structure which contains several taxes, we need to account for the variance of individual taxes and their covariance ( $\sigma_{ij}$ ) between taxes. Since the covariance term can be defined as  $\sigma_{ij} = \rho_{ij}\sigma_i\sigma_j$ , the measure of instability  $\sigma_T^2$  for a tax portfolio at a point in time is defined as:

$$\sigma_T^2 = \sum_{i=1}^n \sum_{j=1}^n R_i R_j \rho_{ij} \sigma_i \sigma_j \quad (4)$$

where  $R_i$  and  $R_j$  are the level of revenue from tax  $i$  and  $j$ ,

$\sigma_i, \sigma_j$  are the standard deviations of taxes  $i$  and  $j$ , and

$\rho_{ij}$  is the correlation coefficient between the two taxes.

Here the revenue instability is estimated as the above tax portfolio variance in millions of squared dollars to scale the resulting coefficients.

### ***Revenue Diversification***

After the Hirschman-Herfindahl Index (HHI)<sup>25</sup> has been widely accepted as a measure for risk-reducing revenue diversification, Suyderhoud (1994) developed a revised HHI to measure revenue diversification. The revised measure indicates the degree of diversification of a particular revenue structure relative to a theoretical maximum and it incorporates four own-source revenue categories: property taxes, personal and corporate income taxes, general sales taxes, and all other revenues including nontax revenues. The measure of revenue diversification used in the study is similar to the one of Suyderhoud and it incorporates the five revenue categories as discussed in the previous section and it is defined as

$$RD = \frac{1 - \sum_{i=1}^5 R_i^2}{0.8} \quad (5)$$

where  $R_i$  is the revenue share<sup>26</sup>. The degree of diversification as measured by this index depends on both the number of revenue sources and the proportion of each revenue type (Chang, 1994). The value of the index ranges from zero to one with increasing values of

<sup>25</sup> HHI is calculated by summing the squares of each revenue share (Suyderhoud, 1994).

<sup>26</sup> This equation can be expressed in an alternative way as  $RD = (1 - \sum R_i^2) / (1 - \sum R_i^{*2})$ , where  $R_i^* = 0.2$  in the context of this study when a government achieves the maximum diversification under the scenario of five revenue categories.

RD implying more balanced government total revenue among the designated revenue categories or higher levels of diversification. Since this variable is used to indicate the degree of diversification in a tax structure and it is interacted with the instability of an economic base, its expected effects will be discussed in the section that introduces the measurement of economic base instability.

Two cautions are needed when interpreting the measure according to Carroll (2005). First, this index assumes that each jurisdiction has the equivalent ability to diversify its revenue structure. However, this might not be the case when revenue or expenditure limitations are imposed and referenda for tax policy changes are required. Second, each government is assumed to utilize the same number of revenue categories as those selected for the calculation. This problem will arise when a jurisdiction that does not have an income tax and a jurisdiction that does not impose a sales tax could possibly show an equivalent level of revenue diversification, while the volatility of the two revenue structures are significantly different. As such, it would be difficult to distinguish the different contributions of revenue diversification to fiscal performance given the two different revenue structures. To address these two concerns, variables of revenue shares from four non-sales tax sources (property tax, license taxes, income taxes, charges and other revenues) are included as controls in the model. Additional discussion of these variables is provided in the later section.

### ***Instability of Economic Base***

The differing nature of economic bases makes the economic activities in a region more or less subject to business cycles or other external fluctuations. This in turn affects the tax revenues of a government. The nature of an economic base can be captured by regional economic instability (REI).

The measure of REI used in this study is the coefficient of variation of the trend-adjusted residuals of annual employment which was developed by Conroy (1972, 1975). The computational formula is defined as follows:

$$ES_k = \sqrt{\frac{\sum_{t=1}^T \left[ \frac{Y_t^k - \hat{Y}_t^k}{\bar{Y}_t^k} \right]^2}{T - 1}} \quad (6)$$

Where  $ES_k$  is economic instability for region k

$Y_t^k$  is observed employment in county k for period t,

$\hat{Y}_t^k$  is employment in that county and period predicted by the trend equation,

$\bar{Y}_t^k$  is the arithmetic average of the respective time series, and

$T$  is the number of time periods included in the analysis.

To derive the predicted employment levels, the study use a trend regression of the form:

$$\log Y_t^K = a + bt + e_t^k; t = 1 \dots T \quad (7)$$

Where  $Y_t^k$  and  $t$  follow that in the previous equation,

a, and b are regression coefficients, and

$e_t^k$  is a random error term.

The variation from a predicted level of employment is a standard way to understand economic instability, and this index measures “the standard deviation of the fluctuations in employment expressed as a percentage of the mean employment level for that region for the period under consideration” (Jackson, 1984) and it generates a unique value for each state over time.  $\hat{Y}_t^k$  rather than  $\bar{Y}_t^k$  is used in equation (6) “to reflect the variance around a growth trend rather than absolute variance over the time period. This reflects the view that growth is a desirable regional attribute” (Jackson, 1984). Here the estimation uses the state level annual employment data from 1986 through 2004. Because the measure of economic instability is constructed in a way to reveal a common attribute of a unit over the time it is observed, the value of the index is constant throughout the observation period for each state but it varies across states.

As discussed earlier, the effect of revenue diversification on revenue volatility may change according to the instability of the economic base. An interaction term of diversification index and economic instability is included in the model to explore this conditional relationship. The coefficient for RD is the effect of RD on revenue instability when  $ES=0$  and the expected effect on revenue instability is positive. The coefficient for ES is the effect of ES on revenue instability when  $RD=0$  and the expected effect on



revenue instability is also positive. Similarly, the coefficient for RD\*ES is the effect of the interaction between RD and ES on revenue instability. The interaction is nonlinear and always depends on the level of both variables. Given the hypothesis suggests that the positive effect of diversification on revenue stabilization becomes more prominent as an economic base becomes more unstable, the interactive variable RD\* ES is expected to have a negative effect on revenue instability.

### ***Other Variables***

Additional control variables are included in the model to isolate the effects of other conditions that also affect the dependent variable. To control for the influence of the varying tax capacity of a state government on its revenue stability, log of per capita personal income of a state is chosen to measure revenue capacity. However, there is no prior expectation of relationship between income and revenue instability.

To control for the size of a state, population (in thousands) and the square of population are included in the equation. Besides the population variable, its quadratic term is also included because the relationship between the population and revenue instability might be quadratic. Since the size of a jurisdiction can have a positive impact on economic stability (Brewer & Moomaw, 1985; Thompson, 1965), the population should be negatively correlated with revenue instability, but the marginal impact could increase or decrease—the quadratic term could be positive or negative.

Besides revenue diversification, financial slack of a government can also serve as a means to mitigate the negative impact of revenue instability and uncertainty. However, slack resources might weaken the effect of revenue diversification on fiscal performance by providing an alternative revenue source (Hendrick, 2002) and presumably, it may increase revenue instability. In the state model, the slack resources are measured by the amount of budget stabilization funds in million dollars and it is expected to be positively associated with revenue instability.

The variables of revenue shares for property tax, license taxes, income taxes, charges and other revenues in the state case are used to distinguish their different contributions to revenue stability relative to sales taxes given that two distinct tax structures may be likely to have the same value of diversification index. Here the revenue

shares are indicated as the percentage of general own source revenues from each non-sales tax source with total sales and gross receipts as the omitted category and their signs need to be explored.

In the state level analysis, besides all factors mentioned above, political factors might also have an influence on revenue variability and the effects particularly salient during the process of tax and expenditure adjustment when governments face unexpected deficits. When subnational governments face fiscal crises, the unexpected deficits are usually expected to be corrected within the same fiscal year, through changing taxes and spending. Among a series of factors that explain the magnitude of the fiscal adjustment, Poterba (1994) suggests that political factors are also important: states with single party control of both the state house and governorship react faster to fiscal shocks through raising taxes and cutting spending by greater amounts than divided governments do. This finding implies political control can affect the degree of fiscal adjustment to unplanned revenue shocks, which in turn can alter the revenue stability. In this study, the political control factor is captured by a dichotomous variable with a unified government equal to one and zero otherwise. The expected sign of the variable is positive.

Table 5.1 provides the detailed description of variables, expected signs of coefficients and data source.

Table 5.1: Variable Information for Revenue Stability Estimation (State Model)

Variable	Description	Expected Signs	Data Source
<b>RS</b>	Revenue instability measured by portfolio variance in million squared dollars (White,1983)		Census of Governments: Government Finances
<b>RD</b>	Revenue diversification measured by modified Hirschman-Herfindahl Index	+	Census of Governments: Government Finances
<b>ES</b>	Regional economic instability measure by coefficient of variation of county employment	+	County Business Patterns (U.S. Census Bureau)
<b>income</b>	Log of per capita personal income	?	Bureau of Economic Analysis
<b>pop_ths</b>	Population in thousands	-	Census of Governments: Government Finances
<b>pop_ths_sq</b>	The square of pop_ths	?	Census of Governments: Government Finances
<b>ptxshare</b>	Percent revenue from property tax	?	Census of Governments: Government Finances
<b>ltxshare</b>	Percent revenue from license tax	?	Census of Governments: Government Finances
<b>intxshare</b>	Percent revenue from income tax (including personal income tax and corporate income tax)	?	Census of Governments: Government Finances
<b>servshare</b>	Percent revenue from service charges and other sources	?	Census of Governments: Government Finances
<b>SF</b>	Budget stabilization fund in million dollars	+	The National Association of State Budget Officers (NASBO)
<b>unified</b>	Unified government=1 and 0 otherwise	+	National Conference of State Legislatures (NCSL)

## 5.4 Regression Results

Given the panel structure of the data set, the model is estimated using fixed effect model with robust standard error because there is a strong correlation (-0.825) between the residuals and the fitted values using other explanatory variables in the model, which is a test of the hypothesis that random effects would result in unbiased estimation, and the

Breusch-Pagan/Godfrey LM test revealed the existence of heteroskedasticity. Since economic instability is a non-varying state characteristic, it does not appear in the fixed effects estimation, i.e. it becomes part of the fixed effect, and it is impossible to ask what the effect of economic instability would be in these data. The estimates generated by standard ordinary least squares (OLS) regression with robust standard error have a weighted average effect from either the averages, the changes, or both of each individual explanatory variable and it recovers the effect of a variable like economic instability. However, the OLS estimates fails to correct for the fixed differences and it can bias the estimates when the residuals are correlated with explanatory variables (Wooldridge, 2005) which is the case here. Therefore, the OLS regression results are provided (in Table 5.4) but not discussed here except for the variable of economic instability.

Table 5.2 gives the descriptive statistics of all variables used in the analysis. As we can see from the table, the mean value of revenue diversification is 0.829 which implies that the 47 states are fairly diversified in their revenue structures as a whole. On average, the states have a smaller economic instability (mean = 0.034) with less variation (Std. Dev. = 0.01) than that of Georgia counties (mean=0.107 and Std. Dev. =0.105). From the revenue share variable, we can see that the omitted category, total sales and gross receipts still accounts for about 37% of the GOSRs, which is still the largest share among all revenue sources. The second and third largest share, service charges (with other sources included) and income taxes take about 29% and 27% of the GOSRs respectively.

Table 5.2: Descriptive Statistics of State Model

Variable	Mean	Std. Dev.	Min	Max
<b>RS</b>	1,765,646	7,387,305	1603.647	99,200,000
<b>RD</b>	0.829	0.068	0.536	0.952
<b>ES</b>	0.034	0.009	0.017	0.060
<b>RD*ES</b>	0.028	0.008	0.011	0.051
<b>pop_ths</b>	5,592.585	5,873.414	534	35,842
<b>pop_ths_sq</b>	65,700,000	163,000,000	285,156	1,280,000,000
<b>income</b>	9.997	0.277	9.230	10.723
<b>ptxshare</b>	0.014	0.031	0.000	0.203
<b>ltxshare</b>	0.054	0.031	0.009	0.234
<b>incshare</b>	0.269	0.122	0.000	0.527
<b>servshare</b>	0.291	0.080	0.150	0.604
<b>SF</b>	163.153	449.273	-3,535	8,666
<b>unified</b>	0.415	0.493	0	1

Note: the above statistics are calculated based on the same number of observations that are used to estimate parameters in Table 5.3, Table 5.4 and Table 5.5.

The fixed-effect regression results of the state level model are listed in Table 5.3. All of the variables except for property tax share, license tax share, income tax share and unified government show statistical significance either at the five percent level (revenue diversification, the interaction of revenue diversification and instability of economic base, population, the square of population, income and stabilization fund) or at the ten percent level (revenue share from service charges and other revenues). Different from what is expected, revenue diversification by itself is negatively related to revenue volatility with the absence of economic base instability. Stated another way, a diversified revenue structure tends to decrease the overall risk of revenue when the economic base of a state is entirely stable or immune to general economic fluctuations and other external shocks. Consistent with the expectation, the OLS regression result as is shown in Table 5.4 suggests that the economic base instability on average is positively correlated with revenue instability when there is a minimum level of diversification in a state's revenue structure. This indicates that the increasing statewide economic instability can cause tax revenues to be more volatile if a state only depends on one revenue source.

Table 5.3: Fixed-effects Estimates for Revenue Instability of States (in Million Squared Dollars)

Variable	Coef.	Robust Std. Err.	t	P> t
<b>RD</b>	-44,200,000	17,100,000	-2.58	0.010
<b>RD*ES</b>	745,000,000	221,000,000	3.38	0.001
<b>pop_ths</b>	-4,032.17	599.01	-6.73	0.000
<b>pop_ths_sq</b>	0.16	0.02	8.38	0.000
<b>income</b>	2,288,607	380,918.50	6.01	0.000
<b>ptxshare</b>	15,500,000	9,545,433	1.62	0.106
<b>ltxshare</b>	10,200,000	9,058,138	1.12	0.263
<b>incshare</b>	12,500,000	8,183,823	1.53	0.126
<b>servshare</b>	7,116,442	4,090,926	1.74	0.082
<b>SF</b>	1,993.82	557.54	3.58	0.000
<b>unified</b>	52,405.31	112,528	0.47	0.642
<b>Constant</b>	-389,828.60	6,788,989	-0.06	0.954

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Number of observation = 893; Number of groups = 47  
Observations Per Group (Min = 19; Avg = 19; Max = 19)  
R-squared: within = 0.7501; between = 0.2752 ; overall = 0.2957  
corr(u\_i, Xb) = -0.8250  
F(11,835) = 25.57  
Prob>F = 0.0000

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Table 5.4: OLS Regression Estimates for Revenue Instability of States (in Million Squared Dollars)

Variable	Coef.	Robust Std. Err.	t	P> t
<b>RD</b>	27,100,000	4,835,769	5.59	0.000
<b>ES</b>	524,000,000	106,000,000	4.96	0.000
<b>RD*ES</b>	-624,000,000	125,000,000	-4.98	0.000
<b>pop_ths</b>	-999.10	122.35	-8.17	0.000
<b>pop_ths_sq</b>	0.07	0.01	11.22	0.000
<b>income</b>	888,645.4	425,422.9	2.09	0.037
<b>ptxshare</b>	1,826,314	2,616,181	0.70	0.485
<b>ltxshare</b>	-7,201,528	1,437,217	-5.01	0.000
<b>incshare</b>	1,415,783	1,223,562	1.16	0.248
<b>servshare</b>	-5,824,040	986,447	-5.90	0.000
<b>SF</b>	2,581.41	843.72	3.06	0.002
<b>unified</b>	246,434.6	204,970.9	1.20	0.230
<b>Constant</b>	-27,700,000	5,376,326	-5.16	0.000

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Number of observation = 893  
R-squared = 0.8897  
F( 12, 880) = 43.01  
Prob>F = 0.000

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Since revenue diversification and economic base instability are measured on a scale base, the magnitude of the effects of the two variables should be interpreted in terms of a change of one standard deviation of each variable. According to Table 5.3, a one standard deviation (0.1) increase in revenue diversification, for example, RD is moving from the mean RD 0.8 to 0.9, can lead to an average decrease in revenue variability by 4,420,000  $(-44,200,000 * 0.1)$  million squared dollars over time. In terms of Table 5.4, revenue instability increases on average by a variance of 5,240,000  $(524,000,000 * 0.01)$  million squared dollars for every unit increase (0.01) in economic base instability (moving from the mean ES 0.03 to 0.04).

However, the main effects of these two variables could happen alone in rare cases, it is less interpretable or may even be misleading to interpret the effects of revenue diversification and economic base instability in isolation. As the theory suggests that the effect of revenue diversification on revenue volatility varies upon different economic

base instability, it is important to consider the effect of their interaction (RD\*ES) as well. According to Table 5.3, the positive coefficient for the interaction term shows that the revenue stabilizing effect from revenue diversification decreases in states as their economic base instability gets higher, which contradicts with the hypothesis. When both the instability of a state's economic base and revenue diversification are taken into consideration, the negative effect of revenue diversification on revenue instability decreases by 745,000 ( $745,000,000 \times 0.1 \times 0.01$ ) million squared dollars on average for every unit increase in the interaction term ( $0.1 \times 0.01$ ) when both RD and ES are equal to zero. The effect is larger, the larger either RD or ES, and is always positive, which gradually offsets the negative effect of revenue diversification on revenue instability.

To capture the overall effect of revenue diversification on revenue risk, which includes the effect of RD in isolation and the interacting influence of revenue diversification and economic base instability, a common way is to calculate the marginal effect of revenue diversification across the range of varying economic base instability. The marginal effect of revenue diversification on revenue volatility is presented in Table 5.5, and it is computed in terms of the economic base instability in different percentiles found in the 47 states. As can be seen from the table, revenue diversification has a negative effect on revenue variability for most of the ES spectrum (up to the 95th percentile) while it has a positive effect from about the 99<sup>th</sup> percentile. The negative effect on revenue volatility is most statistically significant for states that are at or below the 25th percentile of economic base instability or when economic base instability is lower than 0.03. For states in these categories, as is shown in Table 5.5, every 0.1 increase in revenue diversification is estimated to at least decrease revenue instability by 2,225,744.05 million squared dollars. The positive effect is found to be statistically insignificant for states at the higher end of the ES spectrum (the 99th percentile and above) or when economic base instability is greater than 0.06. As is shown in Table 5.5, revenue diversification significantly reduces revenue risk for only a quarter of states that have relatively low economic instability, which is desirable for governments with the stability concern. However, the magnitude of the negative effect decreases as the economic base instability increases until the effect becomes positive. The findings suggest that revenue diversification can reduce revenue volatility under a stable economic



base and the revenue stabilizing effect of diversification decreases when an economic base gets more unstable, which is not consistent with the hypotheses.

A noteworthy point is that revenue diversification affects the revenue instability of jurisdictions along the ES spectrum through a gradual and continuous process. When an economic base gets more unstable, the negative effect of revenue diversification on revenue instability decreases until it passes a threshold, and then the effect reverses: revenue diversification increases revenue variability from that point on though the effect is not statistically significant. The dynamic effect of revenue diversification as illustrated by Figure 5.2 indicates that the revenue stabilizing effect of diversification is very significant for the states that are located in the lower end of the ES spectrum, but the effect is diminishing as the instability of an economic base moves from low to high.

There are two possible reasons that could explain the inconsistent findings. First, on average, the states have smaller economic instability than Georgia counties and the variation of economic instability among states is relatively smaller than that of Georgia counties as well. Furthermore, states are generally really diverse in their industry composition. Therefore, the economic instability at the state level is more likely to reflect the risk from economic fluctuations rather than the non-systematic risk from some random factors given that this risk can be largely absorbed by the diverse industry mix. This also explains the greater homogeneity or smaller dispersion in economic instability that is found across states. Second, the contents of revenue diversification are different between states and counties. Although local governments have reduced their reliance on property tax, property tax is still a major revenue source for counties and other local jurisdictions. Furthermore, property tax is a more inelastic and more stable source of revenue for local governments compared to income and sales taxes. Diversifying local revenue structures essentially increases the revenue shares from other sources but retains property tax as an important revenue component. In the case of Georgia, revenue diversification basically strives for a balance of revenue between the two major revenue sources (property tax and sales taxes), which will not render a highly elastic tax structure for individual counties. Since states handed the property tax revenue to local jurisdictions about a century ago, property tax is no longer a significant revenue source for state governments. Therefore, revenue diversification at the state level implies the efforts of

striving for a balance between the three major revenue sources of states: sales taxes, income taxes and general charges. Given that sales and income taxes are more sensitive to cyclical changes than property tax, revenue diversification efforts in states essentially increase the overall elasticity of the tax structures. Under a stable economic base, the negative impact of the elastic tax structure can be largely contained and revenue diversification mainly manifests its risk-reducing effect through addressing the nonsystematic risk. To be more specific, the nonsystematic fluctuations in economic outputs can be well balanced by a diverse regional economy. To further avoid the negative impacts of nonsystematic risk on tax revenues, a diversified revenue structure is also required to act with the diverse economy. While economic instability gets higher, the negative impact of the elastic state tax structure can be more salient and outweigh the benefits of addressing the nonsystematic risk, which is shown by the upward trend of revenue variability.

For the control variables, income is positively correlated with revenue instability. One percent increase of per capita personal income can result in an average increase in revenue variability by 2,288,607 million squared dollars. The effect of income implies that tax smoothing is a less of a concern for a wealthy state. In other words, wealthier jurisdictions could have more tolerance for risk. None of the revenue share variables except for service charge share which is significant at the 10 percent level are found to be important factors in changing the level of revenue risk. A one percent increase in service charge share is associated with an average increase of revenue instability by 7,116,442 million squared dollars. As is expected, stabilization fund adds to the revenue instability. Every million dollars increase in stabilization fund can increase revenue instability by 1993.82 million squared dollars on average. The population variable is negatively related to revenue instability which is consistent with the expectation. Every thousand increase of state population can lead to a decrease of revenue instability by 4032.17 million squared dollars on average. However, the square of population contributes to revenue instability but at a small margin. Also different from expectation, unified government does not show statistical significance in predicting the level of revenue instability.

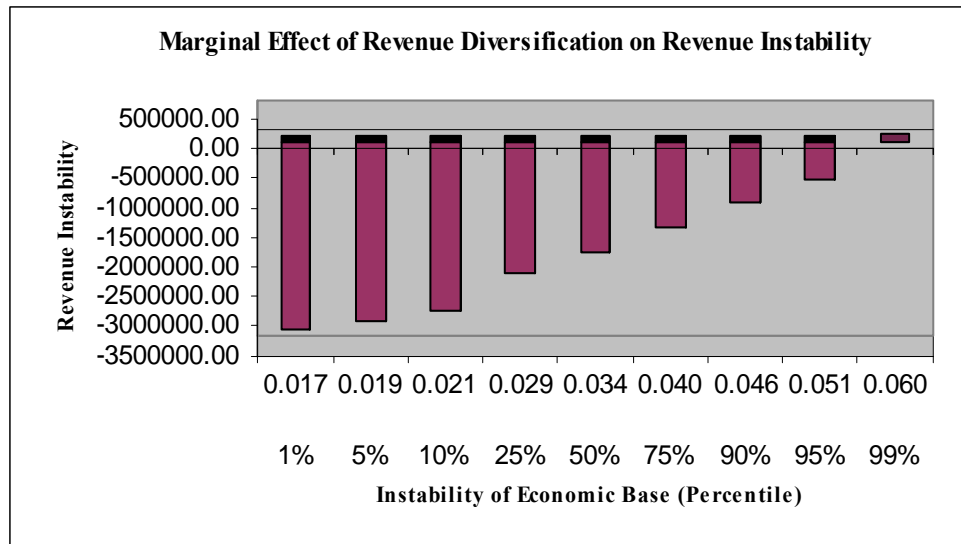
Table 5.5: Marginal Effect of Revenue Diversification on Revenue Instability of States  
(in Million Squared Dollars)

Percentiles of ES	ES	F-value	Prob>F	Marginal Effect of RD
1%	0.0167	4.77	0.0293	-3,173,227.60
5%	0.0187	4.51	0.0341	-3,028,690.15
10%	0.0211	4.17	0.0415	-2,846,932.50
25%	0.0295	2.95	0.0860	-2,225,744.05
50%	0.0343	2.24	0.1352	-1,862,109.55
75%	0.0400	1.44	0.2301	-1,437,951.25
90%	0.0460	0.74	0.3902	-996,657.95
95%	0.0508	0.31	0.5770	-634,982.80
99%	0.0597	0.00	0.9802	30,019.10

Note: 1) N = 893

2) Marginal effect is calculated based on fixed-effect estimates of RD and RD\*ES

Figure 5.2



As a summary, the findings of the state level analysis do not support the hypotheses: revenue diversification significantly reduces the revenue instability of a state which has a stable economic base and the revenue stabilizing effect of diversification decreases when an economic base gets more unstable. The inconsistent findings between the county analysis and the state analysis may be explained by the inherent difference between localities and states in terms of the nature of economic base and revenue structure.

## **CHAPTER 6: CONTRIBUTION AND POLICY IMPLICATIONS**

This study examines the interactive effect of revenue diversification and economic base on revenue stability of counties and states. The research question is tested with two different models but in one theoretical framework, thereby enhancing the generalizability. The first section of this chapter summarizes the research findings on the effect of revenue diversification through interacting with the local economic bases on the revenue stability of Georgia county governments. The second section of this chapter summarizes the research findings on the effect of revenue diversification interacting with the state economic bases on the revenue stability of state governments. The third section provides the policy implication of the dissertation. The last section discusses the limitations and future research directions.

### **6.1 Revenue Diversification in Georgia County Governments**

Drawing from the portfolio theory in corporate finance and the regional science literature, this study developed a theoretical framework with respect to how revenue diversification affects revenue stability through interacting with a jurisdiction's economic base. According to the theoretical framework, the effects of revenue diversification on revenue volatility vary conditional on the instability of economic base. Building on this premise are three relevant hypotheses: 1) under a stable economic base, revenue diversification can increase revenue instability; 2) under an unstable economic base, revenue diversification can reduce revenue instability; 3) the revenue-stabilizing effect of diversification can be enhanced as an economic base becomes more unstable. To test the hypotheses, an econometric model that explores a set of factors that could affect revenue stability is estimated using a pooled cross-sectional time series dataset of 156 Georgia county governments during the years 1986-2004.

Most of the hypotheses are supported by the fixed effect estimations. Consistent with the first hypothesis, the findings suggest that revenue diversification significantly increases the revenue instability of a county that has a stable economic base. This positive effect of revenue diversification on revenue instability appears for most counties in Georgia. However, this positive effect diminishes as the instability of the economic

base increases, which supports the third hypothesis that the revenue stabilizing effect of diversification is enhanced as an economic base becomes more unstable. Revenue diversification decreases the revenue instability of a county that has an unstable economic base, but the effect lacks statistical significance. Given that revenue diversification affects revenue stability through a gradual and continuous process and a majority of the Georgia counties are rural with relatively stable local economies, it is a reasonable speculation that revenue diversification would significantly decrease revenue instability if more Georgia counties are associated with high economic instability.

The county model also suggests that population, sales tax share and general revenue surplus add to additional revenue variability. Per capital personal income, excise tax share, license tax share, and service charge share significantly reduces revenue instability. The square of population does not significantly affect revenue instability.

## **6.2 Revenue Diversification in State Governments**

Based on the same theoretical framework and hypotheses, this study also examines the interactive effect of revenue diversification and economic base on the revenue stability of states. To test the hypotheses, an econometric model is estimated using a pooled cross-sectional time series dataset on 47 state governments during the years 1986-2004.

Different from the expectations, revenue diversification significantly reduces revenue instability for only a quarter of states that have relatively low economic instability and the revenue stabilizing effect of diversification decreases when an economic base gets more unstable. The inconsistency between the two models may be explained by the inherent difference between localities and states in terms of the nature of economic base and revenue structure manifested by the trend of revenue diversification. To be specific, the state economic bases that are built on a diverse industry structure are more stable than those of counties. Therefore, the instability of state economic bases is more likely to reflect the cyclical fluctuations. On the other hand, because of the absence of property tax in state revenue structure, the state revenue structures as a result of revenue diversification will be more sensitive to cyclical changes. Given the significant difference between localities and states, the interactive effect of revenue diversification

and economic base on the revenue stability of states behaves differently from Georgia counties.

The state model also suggests per capita personal income, service charge share, stabilization fund and the square of population significantly increase revenue instability. Population size helps to alleviate revenue instability, though it also affects states quadratically, unlike Georgia counties. Property tax share, license tax share, income tax share and unified government do not significantly affect revenue instability.

### **6.3 Implications of the Study**

The findings suggest that the effect of revenue diversification on revenue instability varies conditional on the instability of a jurisdiction's economic base. Therefore, the degree of revenue diversification should match the nature of a jurisdiction's economic base to achieve the goal of revenue stability. In the context of state governments, a more diversified tax structure should be adopted to enhance the revenue stability when a state has a high economic stability. But when the economic stability decreases, the risk-reducing effect of revenue diversification will be diminishing. While in the context of county governments, a less diversified tax structure should be used to capture the primary revenue source as a strategy to lower the revenue risk when a county has a high economic stability. But when the economic stability decreases, the risk-reducing effect of revenue diversification will be more salient.

The findings hold policy implications. To many people who work or research in government finance, revenue diversification seems to be a desirable path to pursue. However, this paper posits that the practice of revenue diversification should be moderated by the conditions of economic base. From the distinction between economic base diversification and revenue diversification, we know that the economic base is a result of economic, demographic development other than policy and its diversification will only be realized through a long-term development process. Additionally, it is important to realize that sometimes its outcome is unpredictable. Theoretically speaking, a government has more direct control over tax structure and the diversification of tax structure can come as a result of certain policy actions. For example, the range of possible economic bases for taxation is less of a decision variable than the actual tax

structure for the taxing authority. The economy yields a set of possible economic bases for taxation; the jurisdiction then chooses a subset of realized economic bases as the tax base and assigns the appropriate tax rates to establish the tax structure. Although, in subsequent periods, firms may react to the government's choice of tax structure, the reverse effect of revenue structure on economy and economic bases is beyond the scope of the study.

The theoretical assumptions and empirical findings emerging from this research reflect the outcome of revenue stability based on rational choices of different tax structures. Full awareness of the nature of economic base and complete fiscal home rule are the two implicit assumptions. In practice, there may be statutory, political and/or practical constraints that limit the extent to which a jurisdiction can diversify. For example, a variety of circumstances, needs, responsibilities, and resources that a particular government is facing can prevent a balanced use of different revenue sources (Suyderhoud, 1994). Political and legal reality, such as constitutional strictures and special funds accounting practices, also imposes constraints on the ability and opportunities to reach diversification and balance. In addition, changes in tax structure oftentimes are incremental because policy makers and taxpayers resist dramatic changes in tax structure. And an observed tax structure for a jurisdiction is often a reflection of voters' and policy makers' preferences. As discussed earlier, if there are various revenue options, a government could consider a combination of taxes with low elasticity for the purpose of achieving an even higher stability of tax revenue and further lower the systematic risk which could cause dramatic declines of tax revenue during the economic downturn. However, the drawback of this inelastic tax structure is that during a period of economic growth, the growth of tax revenue may not keep pace causing adequacy concerns. That is, the government may not be able to generate sufficient revenue to pay for the increased demand for public services that accompanies economic growth. There is always a trade-off between revenue stability and growth. The desirable tax structure is often consistent with political preferences. If revenue stability has been the greatest concern for a local government (for example, County A), the desirable tax portfolio should include a set of inelastic taxes; on the contrary, if decision makers or voters of County A prefer revenue growth more than the maximum stability, the ideal revenue



structure should combine both elastic and inelastic taxes, because it will not entirely choke the growth of revenue while maintaining some stability. This explains why there is great heterogeneity in tax structures across jurisdictions and there are no “one-size-fits-all” criteria to define a desirable tax structure.

From the public financial management perspective, policy-makers should still pay more attention to revenue diversification, given its controllability and short-term impact. For the long term, the policy direction should still focus on bringing in growing industries that promise to diversify the economic base through appropriate development strategies.

#### **6.4 Limitations and Directions for Future Studies**

Constrained by the data availability, this study does not account for the impacts from the legislated changes to tax rates or bases which could presumably affect the revenue stability and growth. Policy makers should interpret the results with caution and adjust findings with the corresponding realities.

Revenue stability, as one might expect, is a significant factor that rating agencies take into account in determining a government’s capacity to pay off debt. High revenue volatility implies higher risk or uncertainty associated with the timely payment of principal and interest, and thus lower credit ratings. Given that this research shows the different effects of revenue diversification on revenue stability through its interaction with a jurisdiction’s economic base, an important question for future research is whether the interaction between revenue diversification and economic base will be further translated into credit ratings through the different levels of revenue stability.

In addition, according to the regional science research, industrial diversification may change the regional vulnerability to systematic and nonsystematic risk, and thus the regional economic stability. Based on this causal relationship, it will be interesting to explore whether the impact of revenue diversification on revenue stability is conditional on regional industrial diversification. Building on the finding, it will be important to examine the differential impacts of revenue diversification, industrial diversification and their interaction on credit ratings of sub-national governments.

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## Vita

### Wenli Yan

Born November 29, 1979 in Huizhou, Guangdong Province, China

### Education

- Ph.D. Candidate, University of Kentucky  
Martin School of Public Policy and Administration, ABD
- MPA University of Kentucky  
Martin School of Public Policy and Administration, 2004
- BA University of International Relations, Beijing, China  
International Economics, 2002

### Publication

- “Is management performance a factor in municipal bond credit ratings? The case of Texas School Districts,” Dwight V. Denison, Wenli Yan and Zhirong (Jerry) Zhao, *Public Budgeting and Finance*, 27 (4), 86–98.
- “Revenue Structure and Nonprofit Borrowing”, Wenli Yan, Dwight V. Denison and J.S. Butler, *Public Finance Review*. (Forthcoming)

### Professional Experience

- Research Assistant, Martin School of Public Policy and Administration, University of Kentucky (2005-2008)
- Graduate Assistant, Office of Residence Life at the University of Kentucky (July 2004-Dec.2004)
- Research Assistant, University of Kentucky Center for Health Services (Sept. 2003-May 2004)
- Program Coordinator, Office of International Affairs at the University of Kentucky (Summer 2003)
- Research Assistant, Department of Economics, University of Kentucky (Jan.-April 2003)
- Assistant General Manager, Kongyue Technology Co. LTD., China (Mar.2002-Aug. 2002)
- Delegate, Model United Nations, 2002, Beijing, China, May 2002